OLUME 14 1938 NUMBER 2

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# ECONOMIC GEOGRAPHY

## APRIL

AGRICULTURAL GRADIENTS IN SOUTHERN ONTARIO
J. R. Whitaker

ECONOMIC GEOGRAPHY OF TRANS-JORDAN
E. Ray Casto and Oscar W. Dotson

THE BLACK FOREST: ITS HUMAN GEOGRAPHY
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TRENDS OF PHILIPPINE SUGAR PRODUCTION
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MANUFACTURING DISTRICTS OF THE UNITED STATES
Alfred J. Wright

SPONGE INDUSTRY OF THE CARIBBEAN AREA
George S. Corfield

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*(Indexes of* ECONOMIC GEOGRAPHY *are issued every October for the volume just completed. The articles of the magazine are also indexed in the International Index to Periodicals to be found in every United States Library.)*

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# ECONOMIC GEOGRAPHY

## CONTENTS FOR APRIL, 1938


AGRICULTURAL GRADIENTS IN SOUTHERN ONTARIO . . . . . 109
J. R. WHITAKER

ECONOMIC GEOGRAPHY OF TRANS-JORDAN . . . . . 121
E. RAY CASTO AND OSCAR W. DOTSON

THE BLACK FOREST: ITS HUMAN GEOGRAPHY . . . . . 131
ALICE F. A. MUTTON

TRENDS OF PHILIPPINE SUGAR PRODUCTION . . . . . 154
ALDEN CUTSHALL

AGRICULTURAL PROBLEMS IN GRAINGER COUNTY, TENNESSEE . . . . . 159
ROBERT M. GLENDINNING AND E. N. TORBERT

PRINCE RUPERT, BRITISH COLUMBIA . . . . . 167
JOHN Q. ADAMS

OTOMI INDIANS OF MEZQUITAL VALLEY, HIDALGO . . . . . 184
H. C. LANKS

MANUFACTURING DISTRICTS OF THE UNITED STATES . . . . . 195
ALFRED J. WRIGHT

SPONGE INDUSTRY OF THE CARIBBEAN AREA . . . . . 201
GEORGE S. CORFIELD

REVIEWS . . . . . 207



ECONOMIC GEOGRAPHY

Published Quarterly by

CLARK UNIVERSITY, at 10 Ferry Street, Concord, N. H.

*Editorial Office*, Clark University, Worcester, Massachusetts

PRICE, $1.50 THE CURRENT NUMBER FIVE DOLLARS A YEAR
(except to charter subscribers)

Entered as second class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879



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## SOUTHERN ONTARIO

THE interlacustrine southern extension of the Dominion of Canada plays an ever-increasing rôle in the economic and political affairs of the country. Its agricultural industry dominates the life of its people, and the uniformity of farm distribution, pattern, and practice makes the region one of the most integrated in the Dominion.

Relatively a highly improved, fully populated, and well-ordered section, it represents one of Canada's richest and most active areas. Almost surrounded by territory of the United States with which its folk have much intercourse and business connections, it maintains its Canadian character because of the lake barriers that isolate it.

Southern Ontario constitutes the physical and cultural transition from the fertile arable Central Lowland of North America of which it forms the northernmost part, to the rocky, inhospitable Laurentian Shield which borders it. One-third of Canada's folk dwell within the area and it is they who must crystallize the policies of the dominion and shape its destinies. About them Canada builds itself.

ECONOMIC GEOGRAPHY

VOL. 14 APRIL, 1938 No. 2

# AGRICULTURAL GRADIENTS IN SOUTHERN ONTARIO

*J. R. Whitaker*

WELL-KNOWN are certain agricultural contrasts in Southern Ontario, such as the marked change in the percentage of improved land encountered in crossing the southern border of the Laurentian Shield. Other contrasts, including those found along the face of the Niagara cuesta, are probably less commonly recognized. The results of an analysis of these agricultural gradients are presented here.

Interest in this general area (Figure 1) rests in part on the foremost position held by Peninsular Ontario in Canadian economy, for this region, which lies south of a line extending from Georgian Bay to the eastern end of Lake Ontario, is one of the more productive sections of the Dominion and contains nearly a third of the Canadian people. Moreover, the portion of the Shield included in the area under consideration furnishes a sample of the cultural development of a region which makes up nearly two-thirds of all Canada. Much of man's experience in occupying these two natural regions is clearly recorded in the distribution of farm land and in the proportion of that land in different uses. Southern Ontario also illustrates the occupation of glacial plains on the poleward border of the deciduous forest of middle latitudes, by peoples strong in the traditional modes of life of the northeastern United States and northwestern Europe.

Field, statistical, and historical methods were used in this study of agricultural gradients. Isarithmic maps of the major land uses were prepared from census data and taken into the field. On the basis of field evidence, the isarithms were shifted somewhat, but only within the range of the individual townships. The statistical grill furnished by the townships forms a very close one (Figure 2), and the traverses were so laid out as to cross the areas of strong agricultural contrast, as revealed by the preliminary maps. The maps here presented are all for the 1931 census, but they have been checked against similar maps for 1921. Traverses and interviews, and library work at the University of Toronto, the University of Western Ontario, and the University of Wisconsin, furnish the basis of interpretation of the distributions. Parts of three field seasons, 1931, 1932, and 1935, were spent in the surveys on which this report is based. The field work was supported by the University of Wisconsin and the National Research Council.

## LAND IN FARMS

The Peninsula, which is the Canadian portion of the Central Lowland of North America (Figures 1 and 5) is a land of farms, and the Shield is primarily woodland. Very weak gradients in the percentage of land in farms characterize the Lowland. Minor variations from

township to township exist, but no major departures are found except in the rugged tip of Bruce Peninsula (northern Bruce County) and in the urbanized area which extends from Toronto around to the Niagara River. This uniformity of farm distribution reflects both the lack of major differences in the productivity of the land and the length of settlement. Although white settlement of this area did not begin until the latter part of the eighteenth century, the land was taken up so rapidly by settlers from eastern United States and northern Europe that, except for Bruce Peninsula, every township in the Lowland had some settlers by 1857. Moreover, agricultural settlement was ponded south of the Laurentian barrier until railroad connections were opened up to the Western Prairies in 1885, with the result that practically all of the available farm land was occupied by that date.

There has also been ample time for that part of the Shield which extends into southern Ontario to have been converted into farms, and, indeed, a determined effort was made to establish farmers in the wake of commercial lumbering. Despite official colonizing efforts through glowing advertisements, free grants of farm land, and the construction of colonizing roads, settlement has not prospered. This failure has been clearly described in the writings of H. A. Innis, A. R. M. Lower, and W. A. Mackintosh. Most of the area, one of thin, stony, and gravelly soils, is not of agricultural utility under present-day conditions, and does not give promise of becoming so within the near future. As a consequence of the failure of the plow to follow the axe, the percentage of land in farms drops rapidly as one enters the Shield from the Lowland. Some areas of close settlement do occur within the Shield on three of the colonization roads, but at least two other such roads

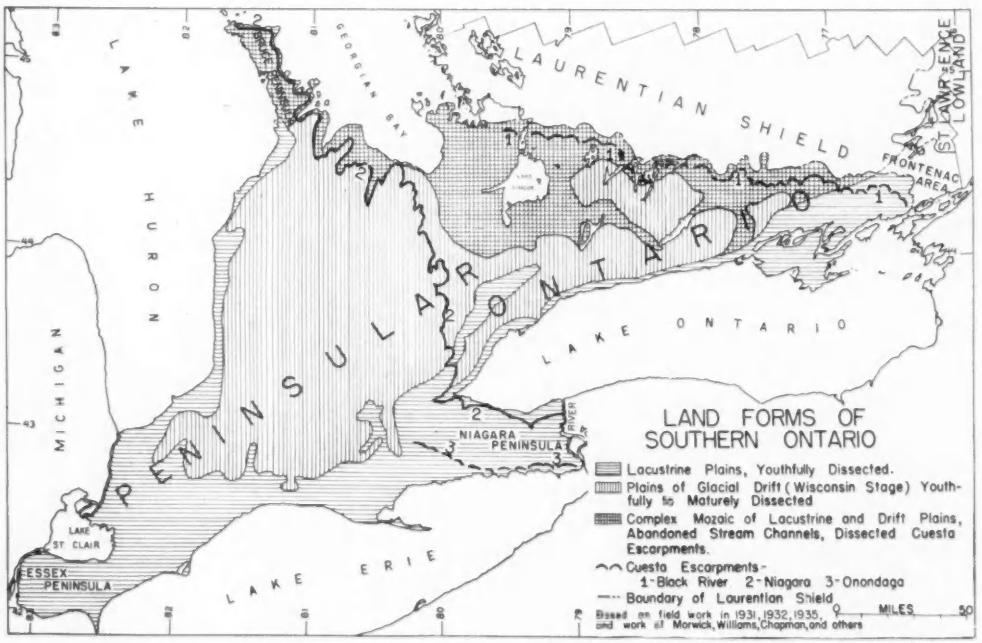
LAURENTIAN SHIELD
ST. LAWRENCE LOWLAND
FRONTENAC AREA
GEORGIAN BAY
LAKE HURON
MICHIGAN
PENINSULAR ONTARIO
LAKE ONTARIO
NIAGARA PENINSULA
NIAGARA RIVER
LAKE ST. CLAIR
ESSEX PENINSULA
LAKE ERIE
LAND FORMS OF SOUTHERN ONTARIO
Lacustrine Plains, Youthfully Dissected.
Plains of Glacial Drift (Wisconsin Stage) Youthfully to Maturely Dissected
Complex Mozaic of Lacustrine and Drift Plains, Abandoned Stream Channels, Dissected Cuesta Escarpments.
Cuesta Escarpments - 1-Black River 2-Niagara 3-Onondaga
Boundary of Laurentian Shield
Based on field work in 1931, 1932, 1935, and work of Morwick, Williams, Chapman, and others
0 MILES 50

FIGURE 1.—Southern Ontario includes portions of the Laurentian Shield and the St. Lawrence Lowland and all of the Canadian portion of the Central Lowland. This section of the Central Lowland, commonly termed "Peninsular Ontario," is a cuestiform plain dominated by the Niagara cuesta, but modified considerably by glaciation.

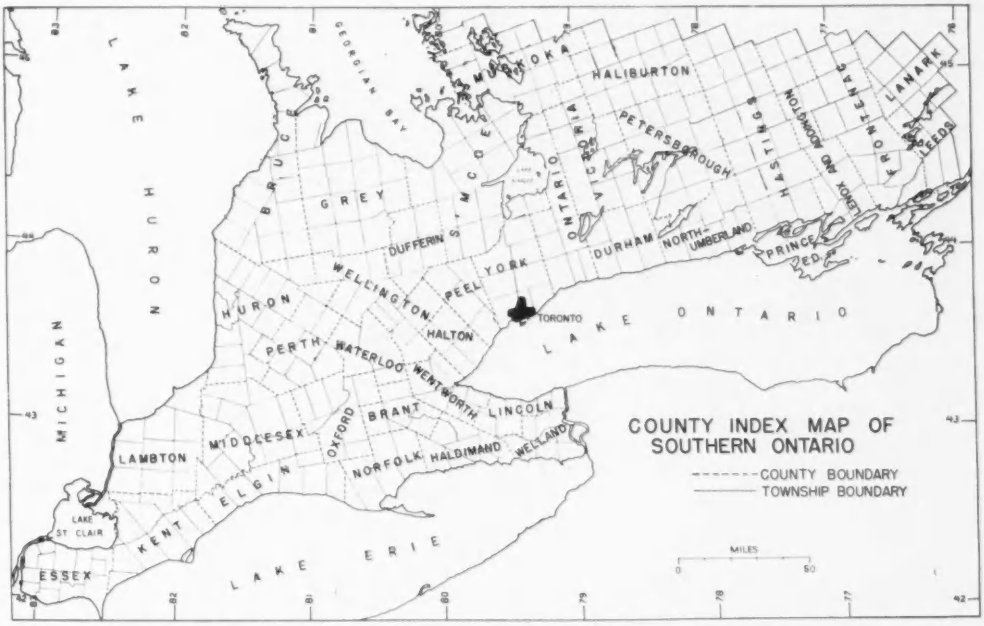


FIGURE 2.—Statistical data by townships are required to bring out the sharp contrasts in land use found along such zones as the crest of the Niagara cuesta and the border of the Shield.

failed to result in an appreciable increase in the acreage in farms.

The one notable exception to the generalization that farm land constitutes a small proportion of any section of the Shield in southern Ontario is the neck of land which connects the main body of the Shield with the Adirondack Mountains, thereby separating the Peninsula or Great Lakes Lowland, from the St. Lawrence Lowland (Frontenac area, Figure 1). This area is an agricultural bridge connecting the two most extensive and productive farming areas of eastern Canada. The problem met here —to account for the agricultural productivity of this part of the Shield—is complicated and not fully solved, but it may be noted that although the rocky, mammalated surface of the Shield continues to the St. Lawrence River, the low areas between the ice-scoured hills are floored with till rich in limestone fragments, transported from the St. Lawrence Lowland, and with deposits of marine clay formed during the time of the Champlain Embayment. In addition, the use of this area for agriculture was stimulated by the early construction of the Rideau Canal between Lake Ontario and the Ottawa River and of roads between the Great Lakes and St. Lawrence Lowlands. Agricultural occupation was also favored by the expansion of settlement from the good farm lands adjacent, and by proximity to eastern markets.

## PRIMARY CLASSES OF FARM LAND

Farm land is divided by the Canadian census into four primary classes: (1) Improved land—land which has been brought under cultivation and is now fit for the plow. This class also includes areas occupied by buildings. (2) Wet marsh and other waste land. This land has essentially no productive value, not even for pasture or woodland. (3) Land in woods. This class, in general, includes pastured woodland. (4) Land in non-plowable or unimproved pasture. This type of land includes land cleared

FIGURE 3.—The Peninsula is a land of farms. This picture, taken southeast of Lake Simcoe, shows Peninsula. (Courtesy of Province of Ontario Pictures.)

and used for pasture, but not cultivable.

Within the Shield, contrasts in the percentage of improved land are not great (Figure 7), and, in the main, cut-over and stony pasture—unimproved land—dominates the scene. The uniformly low percentage of improved land in the Shield reflects the predominance of wet, stony, gravelly, and sandy land, with the improved areas being small patches of naturally good soil or that painfully won by the removal of boulders. In addition to these unsatisfactory aspects of the soils, they are decidedly podsolic, a trait favored both by latitude and by soil texture. The writer's observations on this point are in harmony with those of F. F. Morwick, as reported in *Scientific Agriculture*, XIII, 1933, p. 451. The steepest gradient in the percentage of improved farm land is found along the Laurentian Border.

An outstanding feature of the distribution of improved farm land is the high percentages which prevail over the Peninsula, a condition dependent on surface configuration, soil, and drainage. The common lack of bare rock surfaces, erosion scars, extensive swamps, and shifting sand dunes is striking, no matter from what direction the Peninsula is approached.

The high percentage of improved land in the Lowland reflects, too, some noteworthy cultural improvements in both soil and drainage. Large areas along the crest of the Niagara escarpment have been cleared of boulders, and extensive areas, as in Essex and Kent counties, have been drained. As early as 1871, a provincial drainage act gave assistance to farmers in draining wet lands. Lyman Chapman of the Ontario Research Foundation tells of one field where the laying of new drain tile revealed parts of three earlier systems.

The length of time the Peninsula has been occupied has been long enough, as land use goes in America, for the soil to have been despoiled through exploitive farming, thereby decreasing the percentage of improved land. There are areas, as in Norfolk and Northumberland counties (Figure 2), where land formerly cultivated has been abandoned and allowed to revert to woodland. Such areas are few, however, and some of those have been reclaimed in recent years by substituting truck crops and tobacco for general grain-and-livestock farming. For the most part, the Lowland lacks the scars inflicted by destructive exploitation. This is a purely relative matter, but in comparison with Michigan, Wisconsin, and Minnesota, the contrast is notable.

In this connection, one question is par-

the more rolling type of terrain. Otherwise it is a good sample of the more productive sections of the

ticularly pertinent: why are the cultivated areas subject to but slight erosion? The answer is undoubtedly complex. Some of the elements are clear, others are conjectural. (1) The general absence of steep slopes is involved. Large areas of lacustrine plain are too flat to erode seriously except near the streams. (2) The systems of farming are remarkably conservational, depending mainly on hay, small grains, and livestock. The principal cash grain area, in the Essex Peninsula, is too flat to suffer serious erosion. (3) Resident land ownership is dominant. (4) In addition, it may be, as suggested by Chapman, that the clay soils of Southern Ontario do not readily go into suspension. (For a discussion of this point see Ayres, *Soil Erosion and Its Control*, 23–30.)

Strong local contrasts in the percentage of improved land, a common characteristic of areas of complex glacial land forms, are not revealed in the township averages, nor could they be shown

FIGURE 4.—The nearness of this area to Toronto is reflected in the greenhouses in the foreground. The parallelogrammic pattern of roads and fields is characteristic of the Peninsula. (Courtesy of Royal Canadian Air Force.)

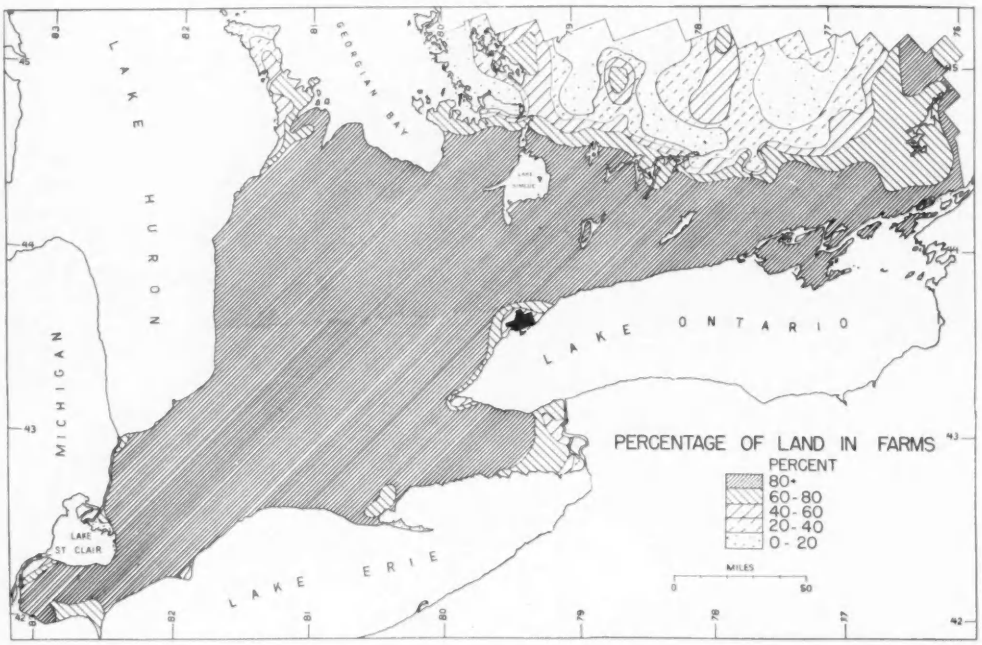


FIGURE 5.—Peninsular Ontario resembles adjacent areas in the United States in the uniformly high percentage of land in farms. The portion of the Laurentian Shield here included likewise bears a striking resemblance in this regard to extensions of the Shield in the Lake States.

on a map of the scale here used. Along the Lake Huron shore northeastward from the St. Clair River, for example, is a sandy stretch which is too small to dominate the statistics for the township in which it lies. There are many such sandy areas scattered over the Peninsula.

Although the percentage of improved farm land in the Lowland is relatively high, with few steep gradients, there are, nevertheless, large contrasts within it: the percentage of improved land ranges from less than 50 in the northern and eastern parts to over 90 in the west central part. This major gradient reflects a fundamental contrast in surface configuration and soils. There is far more rough, stony, or wet land in the more northern area, and there is much stony moraine in the higher parts of the Niagara cuesta (the Niagaran upland), northward from Lake Ontario. The lower percentages found between the highly improved areas in Perth and Oxford counties on the one hand and the Essex Peninsula on the other, are due to poor drainage.

FIGURE 6.—A struggling farm in Haliburton County, Laurentian Shield. Note the ice-polished bedrock in the foreground. Living is hard in such an environment. (Courtesy of Province of Ontario Pictures.)

The waste land (wet marsh and other waste land) varies but slightly within short distances in the Lowland (Figure 11). Most of the townships have one per cent or less. There is a decided rise in waste land, however, as the northern

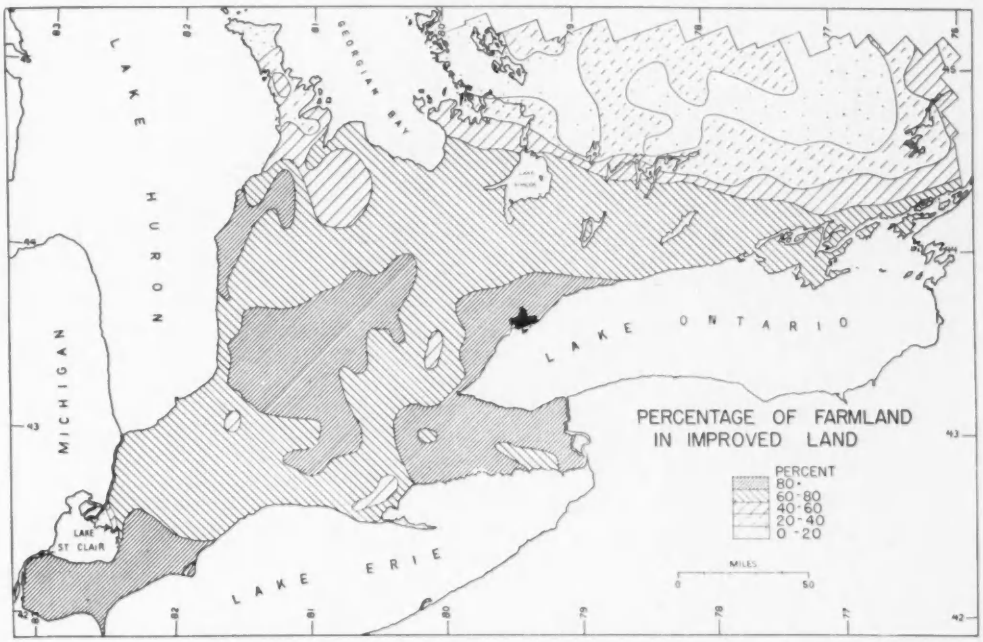


FIGURE 7.—Peninsular Ontario has been described as completely made over by man, a characterization well supported by the high percentage of improved farmland.

part of the Niagaran upland is approached in Bruce and Grey counties. Here, as noted above, is much excessively stony land. Incidentally, it is along the top rather than the face of the Niagara escarpment. The other noteworthy areas of waste lands are the delta lands of the St. Clair, the sandy lands of the Norfolk area (Norfolk County), and the wet lands near the mouth of the Grand River in the Niagara Peninsula. As the Laurentian Border is approached the waste land increases, particularly in the thin-soil areas of the Mapanee Plain (Lennox County) and on the boulder-strewn Black River cuesta.

The per cent of waste land in farms is a fairly satisfactory index to the total waste land in the Lowland, for nearly all of the land is in farms (Figure 5). Not so in the Shield, for there, in general, the farms occupy only the best lands. Even so, the waste land in farms is notably higher in the Shield.

The farm woodlot is an essential element in the farm economy of the Lowland (Figure 13), but continuous woodland characterizes the Shield. The steep gradient along the Laurentian Border suggests this contrast. The increase in total woodland (both in farms and not in farms) is much more rapid along the Border than the distribution of farm woodlands indicates, for much of the Shield is wooded land not in farms. As a matter of fact, the change

FIGURE 8.—The Shield is primarily woodland. It is splendidly endowed and located for recreational use for forestry. (Courtesy of Province of Ontario Pictures.)

FIGURE 9.—In Norfolk County much land once cleared and farmed but later allowed to revert to woodland has been reoccupied by tobacco growers. Here are the greenhouse for raising the young tobacco plants, kilns for drying the tobacco, and a field (foreground) which will be planted to tobacco. Pines dominate the native vegetation.

from detached fragments of woodland surrounded by cleared land to a continuous woodland which includes small, detached clearings takes place in a zone generally not more than half a mile wide —a zone which most commonly rests on the crest of the Black River cuesta, in sight of the Shield, but which occasionally extends a mile or so onto the crystalline area where a thicker mantle of soil exists. The proportion of farm land in woods increases with the distance northward from the Border. That this is mainly due to a decline in the stimuli to land clearance as the distance from the closely settled Lowland increases, rather than to differences in soil, surface configuration, or climate, is the conclusion reached from several traverses across the area in question.

Within the Lowland, the Norfolk sandy area, the crest of the Niagara cuesta, and stony areas of Grey and Bruce counties all rank high in the proportion of the farm land in woodlots. Also, the poorly drained saddle of land between Lake Huron and Lake Ontario has been less completely cleared.

The fourth primary division of farmland—unimproved pasture—strongly resembles the waste land and woodland in its distribution (Figure 15), because, in general, it is land that is too rough or wet for the plow. Outstanding in the Peninsula are the crest and face of the Niagara cuesta and the low saddle between Lake Huron and Lake Ontario. The maximum percentage in unimproved pasture, however, is found along the Laurentian Border and across the Frontenac area, where settlement pushed onto the Black River cuesta and the margins of the Shield. Here a zone of agricultural stimulus overlaps a zone of stony soils not easily prepared for the plow.

### CLASSES OF IMPROVED LAND

Of the four primary classes of farm land just considered—improved land, unimproved pasture, woodland, and waste—the improved land, as might be expected, is the most vital in the economy of the Lowland, though possibly not of

FIGURE 10.—Here and there within the Peninsula are small areas of sandy soil, glacial, lacustrine, or outwash. The apple tree stands in mute testimony to the failure of home-making efforts of a generation ago. The pine seedlings mark a new and more promising use of this type of land.

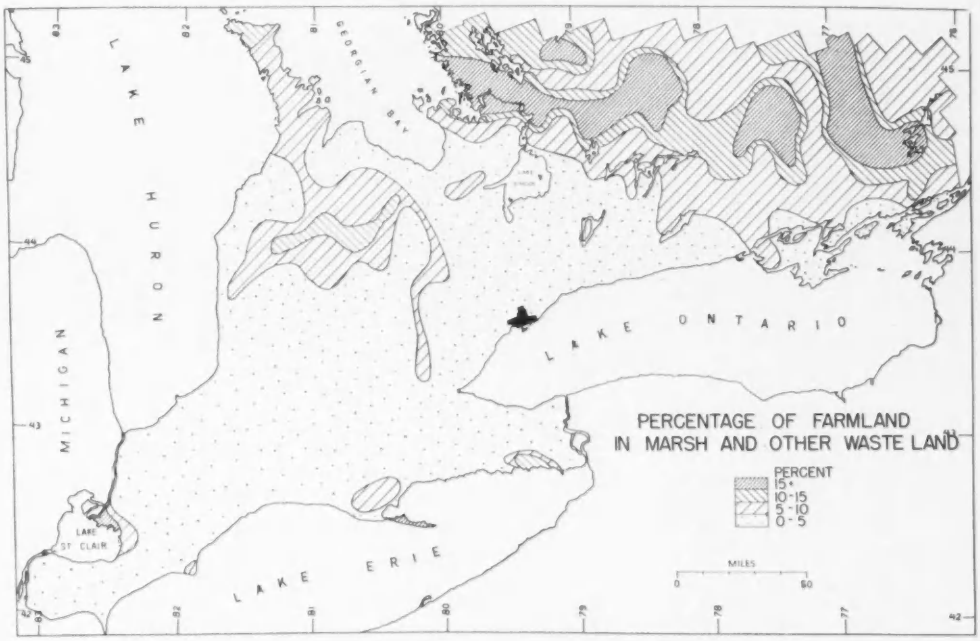


FIGURE 11.—Wet, sandy, and stony lands largely account for the distribution of waste land in farms. By comparing Figures 11 and 1, a number of relations of waste land to land forms are suggested.

the Shield. The improved land is divisible into (1) the plots on which the barns and residence are located, (2) fallow land, generally so small as to justify our ignoring it, (3) improved pasture, and (4) land in crops.

The low percentage of improved pasture in the Shield and adjacent parts of the Lowland is striking (Figure 16). This condition is due, in part, to the scarcity of cultivable land and to the presence of much non-arable pasture.

The principal area of improved pasture borders Lake Huron and extends somewhat inland. The reasons for the extensive development of plowable pasture here are not entirely clear. It is certain, however, that the area has the advantage of suffering little from drought, partly because of heavy rains, partly because of clay soils. This area of high percentage of farm land in cultivable pasture is also correlated with the principal beef cattle area in Southern Ontario. "Pasture farms," farms almost entirely in pasture, are common. This specialization in the pasturing of livestock has evolved out of the more generalized type of commercial grain and livestock farming of the last century. The resemblance to the clay pasture lands of central and western England is striking. The development of this beef-cattle specialty deserves further study.

The sharpest gradients in crop land (Figure 18) are along the Laurentian

FIGURE 12.—Fields like this, on the crest of the Black River cuesta and almost within sight of the Shield, should never have been cleared and improved. The principal commercial product of this locality is Cheddar cheese.

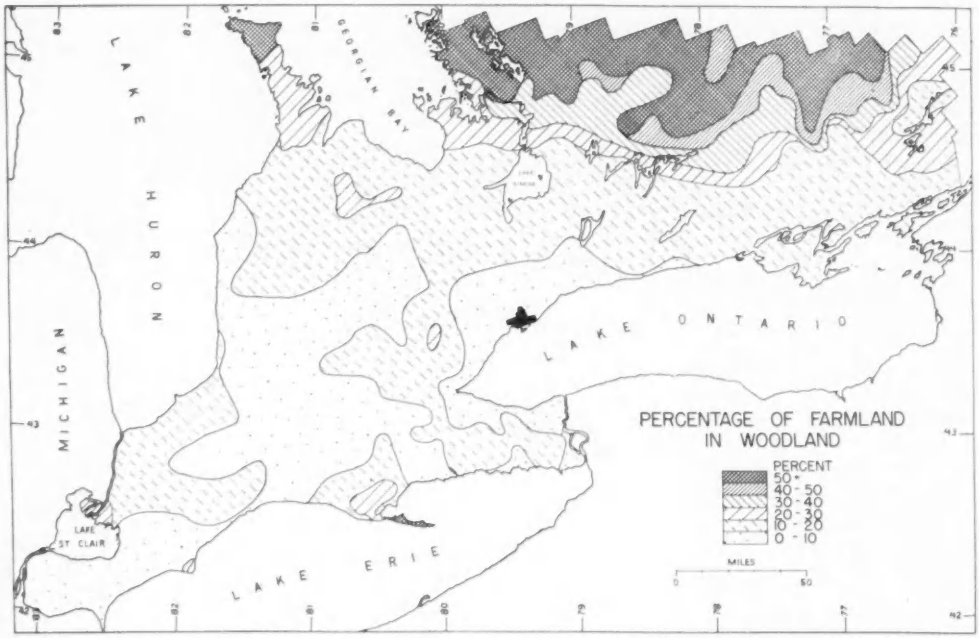


FIGURE 13.—The ideal Ontario farm includes a few acres of woodland. Where the percentage of farmland in woods rises above ten, however, it is certain that other factors, such as sandy soils or steep slopes, are involved.

Border, and just northeast of Lake St. Clair. The first reflects the changes from deep, fine-textured soils, to stony, thin, and poorly drained soils, the second from artificially drained plains to poorly drained lands which have not been improved. Particularly worth noting also are the two areas with maximum percentages—the Essex Peninsula and the area centering in Waterloo County. The Waterloo area unquestionably reflects the thriftiness and intensive methods of the settlers of German descent as well as the suitability of the land for cultivation; the Essex Peninsula is the Canadian section of the American Corn Belt.

## CONCLUSIONS

The principal area of steep gradients for these primary agricultural land uses is along the front of the Laurentian Shield. This is a consequence of the stage of agricultural occupation as well

FIGURE 14.—This lumber mill, which is located within the Shield but only a few miles north of the Border, has been idle for some years. The timber supply is exhausted. The ice-scoured hills clearly have no agricultural worth.

FIGURE 15.—On the low area between lakes Huron and Erie is much poorly drained land in pasture and woods. Water is standing in the field from the rain that fell the day before. This area is specializing in beef cattle.

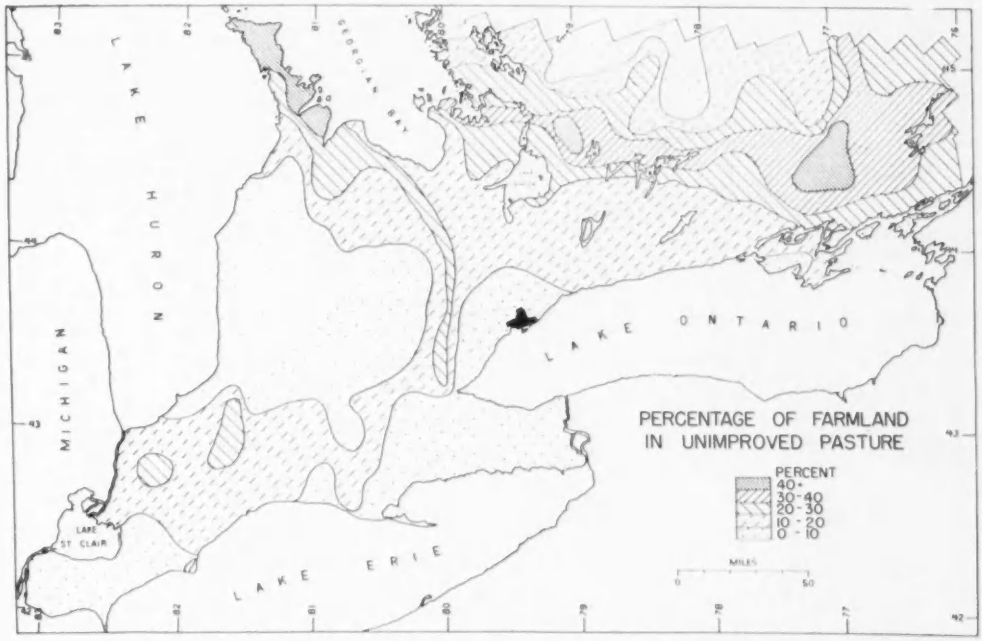


FIGURE 16.—Southern Ontario is a livestock region, with dairy and beef cattle predominant. Accordingly, unimproved land is much in demand for pasture. Much non-arable land is put to productive use in this way.

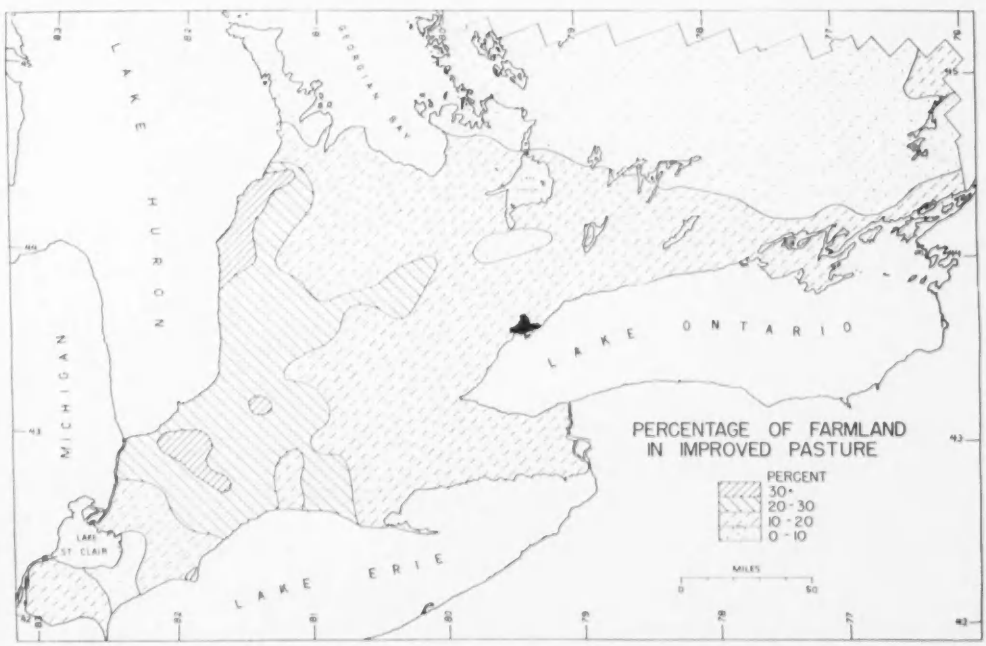


FIGURE 17.—Improved (cultivable) pasture fits into the crop rotation plan of this area. Moreover, pasturage is locally proving to be a more desirable use of arable land than is crop production.

as of contrasts in natural environment. Part of Peninsular Ontario, Bruce Peninsular, must be classed with the Laurentian Shield in its agricultural features.

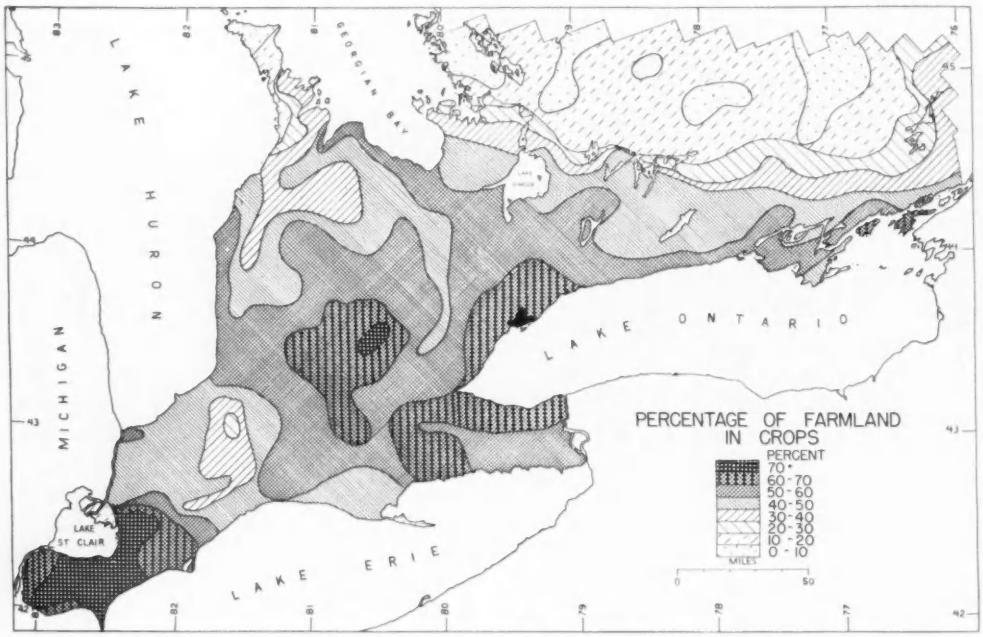


FIGURE 18.—Like the preceding maps, this one of farmland in crops emphasizes the contrast between Shield and Lowland, and the sharpness of the transition between the two. Incidentally, this sharp contrast is not characteristic of the Laurentian Border in the Lake States.

Except for this small area, Peninsular Ontario is a region of weak agricultural gradients; the Shield includes much stronger ones. Rather complete occupance, naturally productive land, and conservational uses help to account for the weak gradients in the one; incomplete occupance and great variation in slope, drainage, and soils for the strong contrasts in the other.

Within the Peninsula, the crest of the Niagara cuesta, the Niagara upland of stony moraine in Grey and Bruce counties, and the area just south of the Laurentian Border rank relatively low in the measures of agricultural productivity here used. On the other hand, the three areas ranking highest are the Essex Peninsula, the Oxford-Waterloo counties, and the western borders of Lake Ontario. Further interpretation of these areas calls for a more complete analysis of regional specialization in agriculture, although it is now clear that the location of these areas and the cultural traits of the people as well as soils, surface configuration, and drainage are involved.

This analysis of primary land uses emphasizes the homogeneity of the Peninsula and its unlikeness to the Shield. In addition, several subdivisions of both Peninsula and Shield are suggested. Supplementary analyses of particular crops and livestock enterprises are required to indicate more fully the agricultural traits of each of these subdivisions.

The economic strength of the Peninsula is seen to rest on a solid base of agricultural resources; the failure of this section of the Shield to develop agriculturally, despite a favorable location, is likewise given quantitative expression in these maps.

# ECONOMIC GEOGRAPHY OF TRANS-JORDAN

*E. Ray Casto and Oscar W. Dotson*

ALTHOUGH a little country, few people have difficulty in finding Trans-Jordan on the map. The Jordan is the world's most universally known river and the buffer state of Trans-Jordan lies east of the river. It is an Arab state under British Mandate and its ruler, Emir Abdullah, has guided his people through some years of peace and progress despite the unrest among the Arabs of neighboring countries.

The completion of the proposed partition of Palestine would greatly increase the area of this Arab state, since the English plan reserves for the Arabs the greater part of present Palestine.

## Geographic Background

The area of Trans-Jordan is approximately 20,000 square miles. Its physical features are even more diverse than are those of Palestine. The western margin zone occupies the eastern half of the remarkable depression—the Rift Valley. The gently sloping surface of this narrow (5 to 8 miles) valley ranges from sea-level to 1,292 feet below sea-level at the Dead Sea border. East of the depression is a longitudinal strip of hill country. Some elevations rise to heights of 5,000 feet, but the average is 2,000 to 3,000 feet. As seen from the Palestine side of the Jordan, the border zone of this range of hills is a long, almost level line of blue mountains. These hills rise with almost precipitous sides from the floor of the plain of the Ghor. Between the hills and the Hejaz Railway lies a narrow plateau of 1,500 to 3,000 feet altitude. The plateau and the hill country are deeply dissected by several perennial streams which drain to the Ghor. The Yarmuk, along the northern border of Trans-Jordan, is the largest tributary of the Jordan. The volume of water contributed to the system is almost equal to that of the Jordan at the confluence. The Jabbok (Nahr es-Zerka) rises among the hills less than twenty miles from the Jordan but flows northeast in a half circle around the Jebel Osha (Hosea) which is the highest peak (3,600 feet) in this portion of Trans-Jordan. The bed of the Jabbok frequently lies 2,000 to 3,000 feet below the level of the plateau.

The Arnon River (Wadi-el Majeb) drains the highlands of Moab and empties into the Dead Sea. The Arnon is the chief river of Moab and rises on the border of the desert. Its deep canyon with bordering cliffs of variegated colors is the most remarkable and pictur-

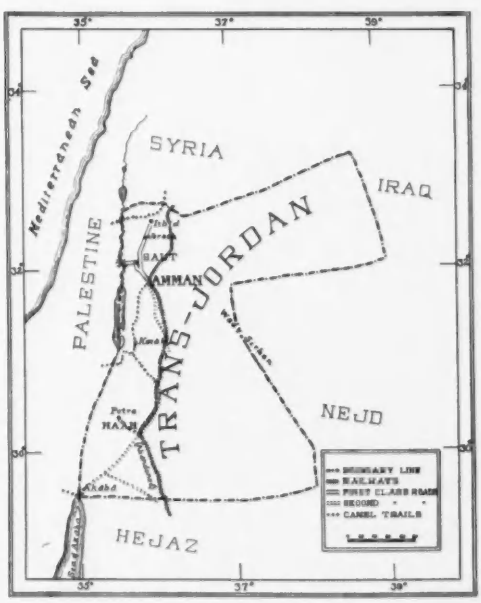


FIGURE 1.—Trans-Jordan, an Arab buffer state, long wild and inaccessible, is making progress in agriculture, industry, and transportation. It is called "an oasis of calm in the Arab world."

esque valley of Trans-Jordan. The dissection of Moab by the Arnon is largely responsible for the lack of political unity among its early inhabitants. Beyond the Trans-Jordan plateau lies a great desert of limestone and flint. The Hejaz Railway is an approximate boundary between the cultivable and the uncultivable areas of the plateau. The elevation of the desert decreases eastward until at the eastern boundary the altitude is not more than 1,000 feet above the level of the sea.

While the northeastern wing of Trans-Jordan is almost wholly desert, it is of vast economic importance. It is traversed by sub-surface, surface, and air lines of transportation. The pipeline which carries oil from the Hamrin oilfields of Iraq (Mesopotamia) passes through it around the northern end of the Sirhan depression. In 1935 oil began flowing through these pipes direct to Haifa. Caravan routes cross its sandy wastes. The Imperial air-route from Baghdad to Amman extends over it. It is the major passageway between Iraq and Palestine.

The Sirhan depression has its upper basin in the east-west and north-south constriction of Trans-Jordan. This saline depression is frequently a source of trouble since it gives the Hejd nomads easy access to central Trans-Jordan. During the winter the Wadi Sirhan is full of rushing water but during the hot dry season (about nine months) water is obtained from wells sunk in the stream bed.

FIGURE 2.—Falls of Boiling Water in the Wadi Zerka Main. The boiling water of the falls is sufficiently cooled by the descent for use in bathing. The stream has its origin in several hot springs in the volcanic mountains. In these springs Herod the Great was bathed. A popular name for them is Herod's Hot Springs of Callirrhoe. (Courtesy of The American Colony Photo Department.)

## CLIMATE

The greater elevation of the plateau of Trans-Jordan above that of Palestine gives the former the advantage of heavier rainfall. The precipitation is usually sufficient for production of excellent crops of grain but the rainfall is not reliable and harvests are sometimes meager on account of prolonged drought which, however, is not so complete as in Palestine. The prosperity of Trans-Jordan is chiefly dependent on its rainfall. The climate of the plateau is distinctly Mediterranean. Precipitation occurring in winter, the period from May to September inclusive, is practically rainless. The winter precipitation averages about ten inches on the plateau about Amman. The rainfall increases northward to Irbid where in six months (November 1928–April 1929) it amounted to 29.6 inches. Records of snowfall are not available but in a recent year at Es-Salt the weight of the snow was so great as to wreck the minaret of a mosque. The rainfall decreases rapidly eastward from the summit of the plateau. The cultivable zone is quite narrow. The climate

of Trans-Jordan immediately east of the railway is the steppe type while the far eastern and southern areas are distinctly dry lands or desert.

As compared with surrounding countries the climate of Trans-Jordan is ideal and invigorating. In summer nights are always cool and day temperatures seldom reach 100 degrees F. in the shade.

The summer climate of the Ghor and of the region at the head of the Gulf of Akaba is hot and oppressive, but the winter climate of these areas is mild and attractive.

## EARLY OCCUPANTS

In very early times at least four tribes occupied the area which is now Trans-Jordan. The Emim, or dreadful ones, lived east of the Dead Sea. They were a race of big men (Deut. 2: 10–11). The Horim, or Horites, were cave dwellers and lived in the region southeast of the Dead Sea. Apparently they were small in stature or at least medium-sized (Gen. 14: 6; 36: 20; Deut. 2: 12, 22). Archeologists have found many of their dwellings in the highlands. The Rephaim lived north of the Jabbok River and are best known through a descendant of the tribe, the Giant Og, King of Bashan at the time of the Conquest (Deut. 3: 1). The Zuzim lived between the Jabbok and the Arnon Rivers. They were large in stature (Deut. 2: 20) and are thought to be the people who in Deuteronomy are called Zamzummin (Deut. 2: 20).

The Ammonites, who once occupied the wilderness between Hebron and the Dead Sea (Gen. 14), later crossed the Jordan and took possession of the Hieromax (Yarmuk). The Jordan Valley was the home of a portion of the tribe of the Canaanites. The Moabites lived between the Arnon and Zered Rivers (Gen. 19: 37). The Ammonites (Gen. 19: 38) and the Midianites (Gen. 25: 2) lived east of the Moabites, and the Edomites (Gen. 25: 21–34; 36: 9) occupied the area south of the Dead Sea.

Trans-Jordan was a part of the Promised Land of the Israelites. Moses and his followers subdued the Later Tribes and conquered the land for the children of Israel. The tribes of Reuben, Gad, and Manasseh were given lands east of the Jordan.

Later occupants of Trans-Jordan included the Greeks, the Nabataeans, the Romans, the Arabs, the Crusaders, and the Turks. The latter were overcome by the British and Arab troops who simultaneously occupied Trans-Jordan in October 1918.

## POPULATION

Trans-Jordan is the heart of the Arab world. Its desert tribes refuse to be

FIGURE 3.—Amman. As the capital of Trans-Jordan, this city has rapidly increased in size and importance. In Old Testament times it was known as Rabbath Ammon (II Sam. 12: 26), and under the Greeks and Romans as Philadelphia. (Courtesy of The American Colony Photo Department.)

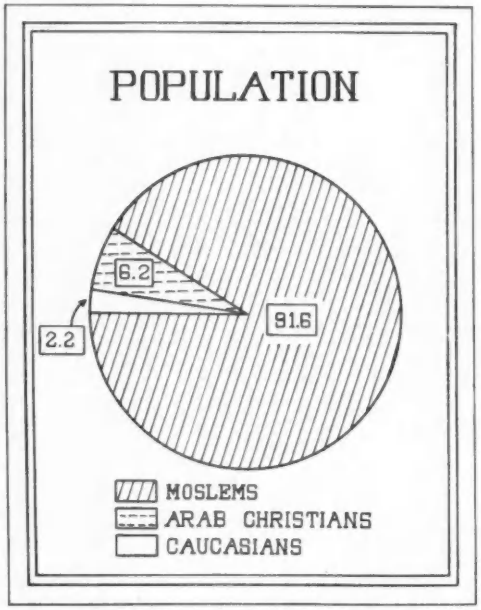


FIGURE 4.—The population of Trans-Jordan is dominantly Arab and the majority of the Arabs are Moslems. The Christians use tents for churches.

dominated or exploited. The population of Trans-Jordan is about 300,000, but no dependable census has been taken. The population is chiefly Arab (270,000). About 20,000 of the Arabs are Christians, 250,000 are Moslem. The Christians are found mainly in towns but several belong to seminomadic tribes of the Kerek District. Trans-Jordan is home of 7,000 Caucasians (chiefly Circassian) and of a few families of Druzes. The Caucasians were settled in Trans-Jordan by the Turks following the Turco-Russian War about forty-five years ago. The military force of 700 Arab men is headed by British officers.

Three classes of Arabs occupy Trans-Jordan: (1) peasant farmers living in villages, (2) seminomads living in tents and possessing both flocks and farm lands, (3) true nomads who migrate great distances with their flocks and herds. The nomad Bedouins do not think highly of the other groups whom they call fellaheen (farmers).

## AGRICULTURE

Trans-Jordan is essentially an agricultural and pastoral country merging eastward into the desert. It has been called a poor country because more than three-fourths of its area is desert and the small area which is cultivated is tilled in a primitive manner, but it is also a country with rich possibilities.

The cultivable lands (1,150,000 acres) are found chiefly in a narrow belt (about 25 miles) extending from parallel 30° N. in the south to the Syrian frontier in the north and from the Jordan River and the Dead Sea in the west to the Hejaz Railway on the east. The cultivable land of this belt is distributed among the embracing physiographic regions: (1) The Ghor, 75,000 acres; (2) The range of hills, 500,000 acres; (3) The plateau, 560,000 acres. The remaining 15,000 acres which are cultivable include several small patches south of 30° N. between Maan and Akaba and the two oases (Azraq and Jafar) within the desert area.

The principal field crops are wheat, barley, lentils, millet, and peas. Although in Trans-Jordan the per capita consumption of grain is high, bread being the chief food, the yield exceeds the requirements of the inhabitants and con-

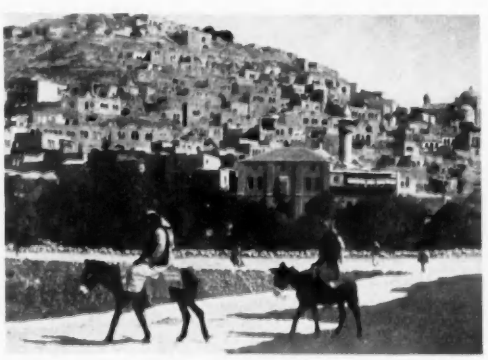

FIGURE 5.—Salt. The little city is built on the steep side of the mountain. It is surrounded by vast vineyards. The grapes of Salt are made into raisins. (Courtesy of The American Colony Photo Department.)

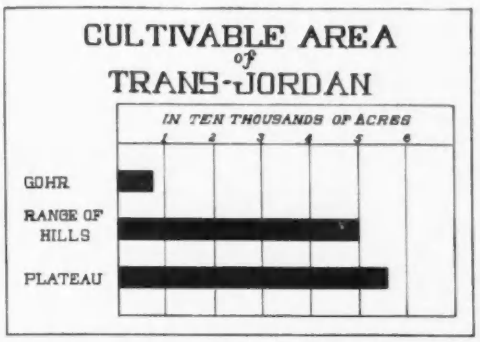


FIGURE 6.—The Pilgrim Railway line marks the eastern limit of the cultivable area of the highland of Trans-Jordan. The winter rain in the narrow cultivable zone of the hills and plateau is sufficient for good yields of cereals. Irrigation is essential for agriculture in the Ghor.

siderable quantities of cereals are exported to Palestine, Syria, and Saudi Arabia. Wheat from Trans-Jordan is carried to the markets of Palestine by camel caravan or by boat by a newly established transportation route across the Dead Sea.

Olives and grapes thrive in the soil and the climate of Trans-Jordan and the yields are good both in quality and in quantity. Fruit trees and vines are little molested by insect pests or plant disease. The surplus of these crops goes chiefly to the Palestine markets. In 1935 the exports of grapes to Palestine amounted to 3,775 tons. The banana crop of the Trans-Jordan depression valley is absorbed in the markets of Palestine. Other fruits are being introduced. The government has four nurseries in which deciduous fruit trees are raised, grafted, and then distributed (31,000 trees in 1935). The carob has great possibilities as a crop in this land. Recently, a nursery of 25 acres was established for the sole purpose of producing grafted carob trees for distribution to landowners.

The fellaheen are loath to abandon their old types of agricultural implements and methods but the establishment of school gardens (32 in 1935), the introduction of courses in agriculture in several schools, and demonstrations on selected plots of land are bringing a slow evolution of agriculture in the land. The Bedouin peasant is much encouraged in his agricultural pursuits because of the fact that order now reigns in Trans-Jordan and he can raise his crops and pasture his flocks without fear of the loss of the fruits of his toil at the hand of the lawless inhabitants of the neighboring desert. Prior to English occupation progress in Trans-Jordan had always been paralyzed by danger. Many roads have been built and the fellaheen are now able to get their surplus crops to market. While they are still living in a state of poverty they are beginning to

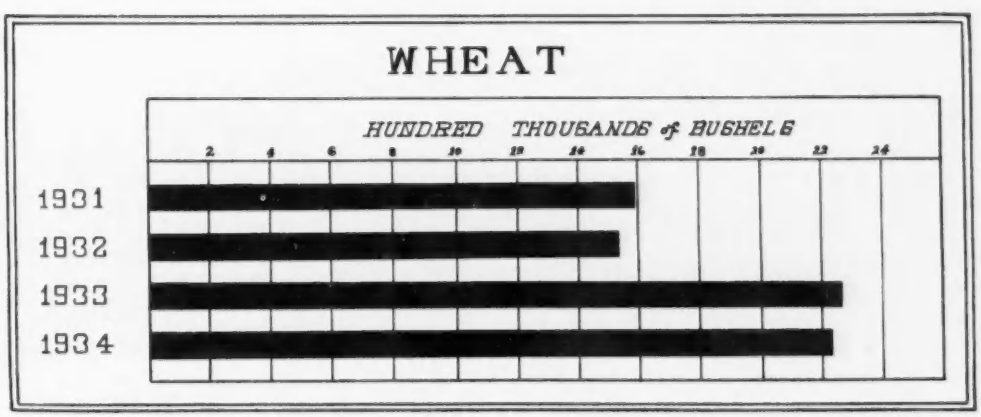


FIGURE 7.—Wheat is the most important crop in the agricultural economy of Trans-Jordan. Considerable quantities are exported to Palestine.

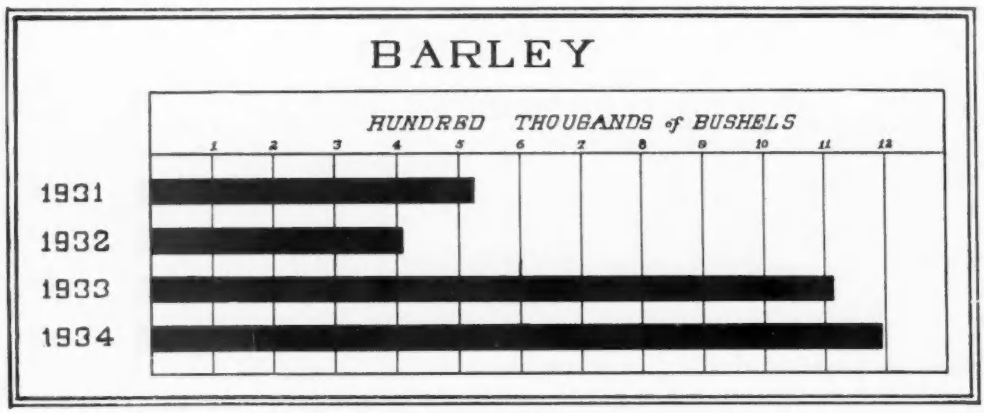


FIGURE 8.—Next to wheat, barley is the most important crop produced in Trans-Jordan, approximately half as much barley as wheat having been harvested in 1933 and 1934.

think in terms of prosperity and their state is no longer a hopeless one.

### FORESTS

The greater rainfall of Trans-Jordan insures a better growth of forests than in Palestine. The Trans-Jordan forests consist chiefly of several varieties of oak, pines, olives, and carobs. Absalom, the son of David, fled from battle and sought refuge in the oak groves of Trans-Jordan. Absalom's mule carried him under a great oak whose thick boughs caught his hair and he hung suspended and helpless (II Sam. 18:9).

Large areas of forests have been destroyed by improper felling for firewood, charcoal, etc., and the too close grazing of herds of goats in the forests. Recently this waste has been stopped by the appointment of forest rangers. The forests are being improved by restriction of grazing and pruning. The trimmed branches, the thorn trees cleared off irrigated areas, and the unexploited dead wood along the bank of the Jordan River yield a sufficient supply of wood for utilization for fuel, charcoal burning, etc.

The government has acquired more than 10,000 acres of valuable forest reserves and is giving energetic support to afforestation. Many thousands (44,000 in 1935) of forest trees are being distributed from government nurseries for planting on private property.

### STOCK RAISING

Two factors make the raising of livestock a major industry of Trans-Jordan: (1) much of the land is unfit for other purposes, and (2) the nomadic element is predominant in the population. The backward and forward shifting of the herds and flocks with the grazing seasons is a serious obstacle to an accurate census of animals in this land where many of the nomads are so inaccessible as to prevent an exact numbering of the people.

In 1928 Trans-Jordan exported 12,000 camels chiefly to Palestine, a major source of income. Recent progress in the Near East has meant a loss of fortune to the camel raisers of Trans-Jordan. Until recently the camel was the principal means of conveyance and transport for the caravans, it ploughed the fields, and turned the mills. The building of improved roads permitting travel by motor, the harnessing of waterpower to turn the mills, and the introduction of tractors are factors of civilization that are making the camel a burden instead of an asset. However, while

the number of camels is decreasing, they will continue to be produced, for no substitute has been found for "the ship of the desert" for crossing of the uninhabited arid wastes of the Near East.

Camels are cared for by men and they claim the first turn to water at the well or spring. The Bedouin girls manage the goats and sometimes have great difficulty in securing water for their flocks (Exodus 2: 15–21).

The Trans-Jordan export of goats in 1928 amounted to 39,000. The nomad and his goats have always been closely associated. Goats graze the land so closely as quickly to make a productive area barren; therefore, there is much more than wit in the statement: "The nomads are not really the sons of the desert, but its fathers." Locally the goat is the most valuable animal possessed by the nomad. This man of frequent change of home site needs an easily movable house, and the "house of hair" or tent made of the woven cloth of the goat is the most flexible of homes. The goats of this land are usually black; therefore, the tent cloth is black (Rev. 6: 12). The goat is a major source of food for the nomad. The milk of the goat and the flesh of the goat are universally used as food among the Bedouins.

The sheep is the animal most frequently selected by the Bedouin in honoring his guests. Custom in Trans-Jordan demands that freshly killed meat be served to visitors. If the host's flock is not readily available he takes a lamb from the flock of another, but the unwritten law demands that the animal be replaced. This law was the source of the parable Nathan used in rebuking David (II Sam. 12: 1–4). The climate of Trans-Jordan favors the production of excellent wool. Much wool is used in local home industries but, in addition, there is a considerable export. In 1935 forty tons of wool were exported. The figures for the export of sheep for many years are not available: 61,000 in 1938 and 27,000 in 1935. The King of Moab was a "sheepmaster" (II Kings 3: 4) and paid tribute of sheep and wool to the King of Israel.

Few horses, mules, and donkeys are raised in Trans-Jordan. Camels as draft animals are supplemented by cattle, more than half of which are so used. Probably in no other country has there been less replacement of draft animals by mechanical and electrical power. Some blooded cattle are being introduced from Europe. The Hebrew tribes entering the land saw that "the place was a place for cattle" (Numbers 32: 1).

In 1932 Trans-Jordan had thirty-two pigs. The consumption of pork and pork products is forbidden the followers of Mohammed and the Arabs who have become Christians have made little change in their diet.

FIGURE 9.—This Bedouin woman of Trans-Jordan is threshing grain with the flail. The primitive methods employed in agriculture make the work tiresome. (Courtesy of The American Colony Photo Department.)

The primitive local tanning industries use most of the hides and skins. The exports of 1935 included nine tons of intestines, and forty-one tons of hides and skins. The export of poultry numbered 34,000 in 1928 and 29,000 in 1935.

### FISHERIES

Some fish are secured locally from the streams of Trans-Jordan. The only organized fishery is at Akaba. The catch is packed in ice and sent by motor-truck to Amman and to Palestine. The beach at Akaba is strewn with countless shells of every size, shape, and color. These shells are carried by camels to Bethlehem, Jerusalem, and Damascus where they are used extensively for making mother-of-pearl articles or for inlay designs in wood.

### MINERAL RESOURCES

The remains of the mineral workings in Trans-Jordan indicate that the early inhabitants smelted copper, iron, and possibly other ores in considerable quantities. The best iron ores of Trans-Jordan contain 65 per cent of iron. These iron ores were much worked by the Crusaders and massive slag heaps are found at Ajlun. Hematite of excellent quality is found in Trans-Jordan, but cheap transport is not available since the existing railway is distant from the deposits; therefore, the deposits have been little worked.

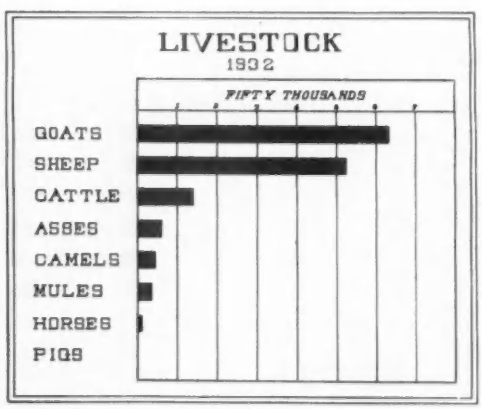


FIGURE 10.—The topography and the vegetation of Trans-Jordan are more favorable for goats and sheep than for other livestock. The evolution of transportation in the Near East is resulting in a rapidly decreasing production of camels. The Moslems do not eat swine.

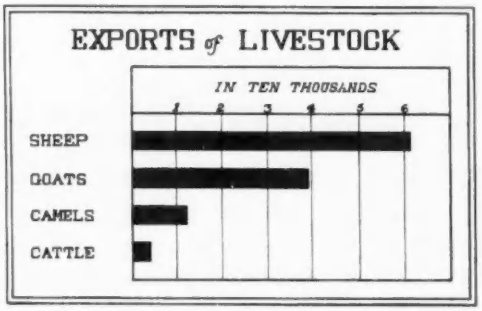


FIGURE 11.—Goats are the leading livestock raised in Trans-Jordan, but are so essentially a source of food and clothing for the inhabitants, the less abundant sheep lead in exports.

Copper minerals occur in many places, but the only ones of economic importance are near Fenan. The utilization of the copper ores of Trans-Jordan is handicapped by an insufficient supply of fuel. Copper ore, remains of furnaces, and copper slag have been found in a deserted area near and south of Petra.

Surveys of the phosphate deposits have located beds of pulverulent phosphate of high quality which can be worked cheaply, and the prospect for the production of phosphate is indeed promising but, as with other minerals, the problem of transportation is an obstacle to any immediate development.

Gypsum of excellent quality is found in Trans-Jordan but, except for its use on the soil, it is of little economic importance.

The western section of Trans-Jordan, i.e. the Rift Valley, has valuable minerals in the form of bitumen, oil, and the salts available from the Dead Sea brine.

Mineral and thermal springs have long been prized for bathing. A long-time concession for the exploitation of

FIGURE 12.—Railway station at Amman. The capital city is a station on the Hejaz Railway. The station is about two miles east of the city near the Amman Aerodrome, a station of the Cairo-Baghdad air route. (Courtesy of The American Colony Photo Department.)

the major springs has been granted to a group of Arabs.

### INDUSTRY

Trans-Jordan is practically devoid of manufacturing industries. Es-Salt has a small plant which produces wine from a minimum part of the product of the local vineyards. Two small factories are manufacturing cigarettes. The land is essentially agricultural and pastoral. In the homes cloth is woven from camel hair, sheep, and goat wool.

### COMMUNICATIONS

Trans-Jordan has been called an inaccessible land. Yet it has been penetrated by the majority of the people of the ancient world. The famous and ancient roadway from the Gulf of Akaba to Mesopotamia crossed the length of the Trans-Jordan highland. It connected Elath, Ezion-Geber, Maan, Petra, Philadelphia, Bozrah, Kerak, and other centers with Damascus.

The Hejaz Railway was built along the great Pilgrim Route to the holy city (Medina) of Islam. Today this line is operating from the Syrian frontier to Maan, but the section beyond has been abandoned and pilgrims must change at Maan from the railroad to caravan. The total length of the Hejaz Railroad in Trans-Jordan is 275.9 miles. Faithful Mohammedans from all over the world contributed funds for the building of this road which serves to shorten the time of the pilgrimage.

Trans-Jordan is much handicapped by inadequate roads. However, the government is constructing and improving roads. The length of motor roads now totals about 1,000 miles. The rapid extension of highway mileage is enabling civilization to penetrate many portions of the plateau so recently dangerous to travelers because of the robber Bedouins. The motor cars of this country do not yet total 300.

The Cairo-Baghdad air route crosses Trans-Jordan. There is an aerodrome at Amman and a fuel replenishing station at Zizia.

The head of the Gulf of Akaba has been filling with sediment. Solomon's port of Ezion-Geber (I Kings 9:26) is some miles from the sea. The old port of Elath (Deut. 2:8) is the site of the present port of Akaba. The bay of Akaba is protected against winds, making the port of Akaba an excellent harbor for a fleet. A canal has been proposed to extend from Gaza through the desert

FIGURE 13.—General view of the ruins of Jerash. The modern Circassian village of Jerash occupies a small portion of the site of the Gerasa of the New Testament. The ancient city became the center of Hellenism in the land across the Jordan. (Courtesy of The American Colony Photo Department.)

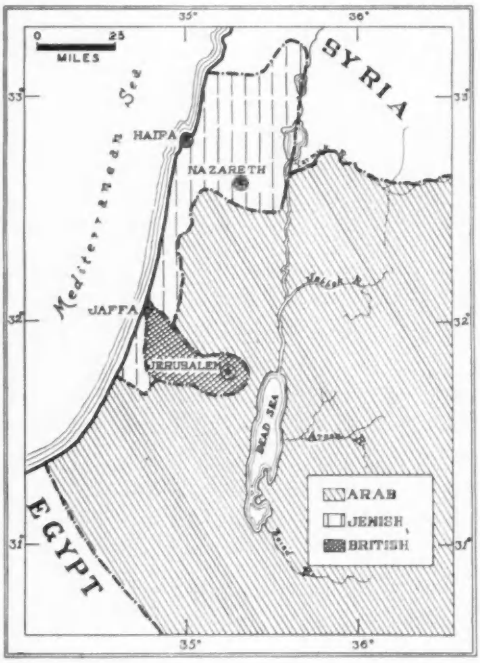


FIGURE 14.—The inhabitants of Trans-Jordan have been intensely interested in the complicated Jewish-Arab problem in Palestine. The proposed partition of Palestine adds much territory to the Arab State of Trans-Jordan.

of southern Palestine reaching the east arm of the Red Sea at Akaba.

Telegraph and telephone service in Trans-Jordan is expanding. In December 1935 the systems comprised a distance of a little less than 500 miles and connections were maintained with Palestine, Egypt, and Syria. The development of this service is handicapped by repeated damage for which Bedouin tribes are largely responsible.

### FOREIGN TRADE

Articles of export are products of the fields or of the pastures. Agricultural exports include wheat, barley, durra, lentils, raisins, olives, olive oil, and vegetables. Animal exports are sheep, goats, camels, cattle, poultry, wool, and hair. Palestine is the major present and potential market for goods exported from Trans-Jordan. The chief imports in order of value are cotton goods, artificial silk goods, benzine, sugar, and coffee. Trans-Jordan allows the transit goods of its neighbors, Syria, Nejd, Palestine, and Egypt, to pass through Trans-Jordan free of customs and transit duties or dues. This transit trade may prove detrimental to the interests of Trans-Jordan in its potential markets.

# THE BLACK FOREST: ITS HUMAN GEOGRAPHY

*Alice F. A. Mutton*

THE Black Forest is a highly dissected, triangular shaped Variscan Plateau, lying mainly in Germany's southwestern frontier state of Baden. It extends N.N.E.-S.S.W. for about a hundred miles, attaining its maximum width of 40 miles in the south and south-center, and tapering towards the N.N.E.

## Part I: Land Forms, Climate, and Land Utilization

The Black Forest is sharply delimited on the west by the line of foothills marking the edge of the Upper Rhine basin. The marginal regions, between highland and lowland, are designated by the Allemannish term *Gau*. They include the districts of Ortenau, between the Forest and the Rhine north of the Elz valley, and the Breisgau, between the Markgräfler Hills and the Rhine, in upper Baden. Between Basle and Waldshut the steep southern slopes of the Forest approach close to the river, and here lies the district of the Albgau, between the Dinkelberg plateau to the west and the Klettgau, to the east of the Wutach valley. To the north, the forested hill country slopes gradually down to the depression of the Ufgau, in which lies the Pforzheim or Maulbronn Gate. To the east, the limit of the Black Forest is not so readily defined topographically, for the long, gentle eastern slope merges gradually into the Baar plateau of Württemberg. However, change in structure is reflected in soils and stream *talwegs*, and the contrast between the thick fir forests of the Bunter sandstone country and the largely open, pastoral, and arable *Muschelkalk* plateau to the east is striking.

This eastern region carries the state divide between Baden and Württemberg. It is a sinuous boundary, following no special physical feature, but although the greater part of the Schwarzwald lies in Baden, parts of it in the northeast, e.g. in the upper Murg valley, where the boundary forms re-entrants, lie in Württemberg. This region is, incidentally, a thickly forested zone and almost devoid of settlement.

### PHYSIOGRAPHY

The Black Forest forms an asymmetrical crustal block, attaining its

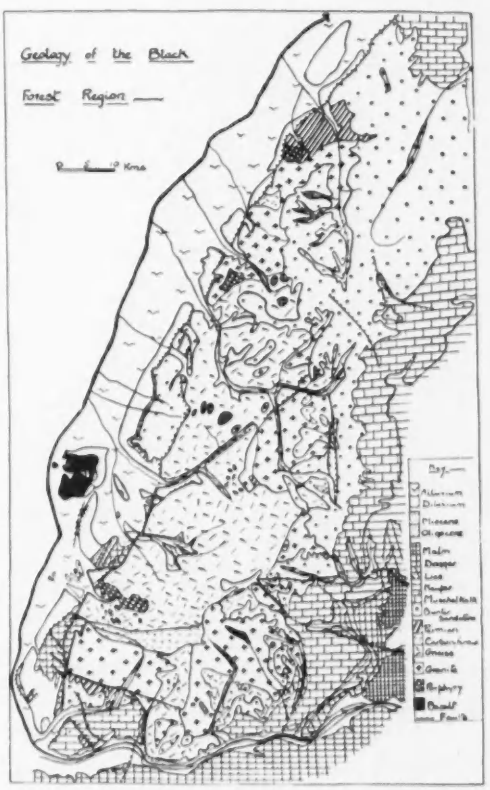


Figure 1.—Contrasts in land form, extent of forest cover, density of settlement, use of the land, and activities of the folk, may all be related to certain features of the underlying country rock.

FIGURE 2.—The western fault scarp edge of the Black Forest (the "Rand" massif) south of Achern. Fir and spruce forest and scrub are found on the light sandy soils weathered from the Bunter sandstone.

maximum altitudes in the south-center (in the Feldberg, 1,493 meters, the Belchen, 1,414 meters, and the Schauinsland, 1,286 meters), where gneissic rocks form the core of the region. These basement rocks also occur farther south, where they form minor hill masses, and they also underlie the culminating height of the northern Black Forest, the Hornisgrinde (1,164 meters). A discontinuous series of intruded granites lies around these crystalline rocks, e.g. southwest of the Feldberg massif, around Triberg, the Hornisgrinde, and in the Murg valley (Figure 1). Throughout the Black Forest, the Variscan fold trend (S.S.W.-N.N.E.) is apparent, and another striking feature is the bevelled and uplifted Permo-carboniferous erosion surface which forms level areas, especially in the south and south-center, at altitudes varying from 1,800 to 2,000 feet.

The Triassic Bunter sandstones, covering an area almost equal to the Primary rocks, give rise to sharp contrasts in land forms, extent of forest cover, density of settlement, etc. They extend over a wide tract in the northeast, where only the deep-cut valleys of the Murg and Enz show the outcrop of granitic and gneissic rocks beneath the sandstone. A narrowing band of Bunter sandstone outcrops from Pforzheim south along the eastern margin of the Forest to Bonndorf, and then appears again in patches, e.g. around Waldshut and Schopfheim.

Another important feature of the morphology of the region is the occurrence of *Muschelkalk* (shelly limestone) in the form of narrow and broken platforms along the western edge of the Black Forest, e.g. in the Markgräfler Hills of the Breisgau, and in the Dinkelberg plateau in the southwest. The eastern margin of the Forest, as has already been pointed out, lies along the junction of the Bunter sandstone slopes and the *Muschelkalk* limestone of the Baar plateau.

The Tertiary period saw the general uplift, tilting, and progressive collapse of the Vosges-Black Forest arch. The foundering of the rift valley of the Rhine was accompanied by a series of step faults, trending mainly S.S.W.-N.N.E., marking the edges of the *Graben* and reflected in the terraced ascent of the western side of the Schwarzwald, from the Rhine Plain, via the foothills, to the dissected scarp edge. At the same time, the margins of the rift were further broken, through the formation of lowland "bays" (e.g. the Freiburger *Bucht* and that of Staufen). An additional feature was the shattering of the southern Black Forest by faulting, especially in the Dinkelberg plateau. The emergence of the Kaiserstuhl, northwest of Freiburg, and the volcanoes of the Hegau, extending from the Baar to Lake Constance, date also from the period of Tertiary upheaval.

In recent times, three main features bear on the present land forms of the Black Forest and its marginal regions. The Tertiary sediments of the Rhine

basin have been covered by an accumulation of fluvio-glacial gravels and finer alluvium, into which the Rhine cut a devious channel prior to its regulation (completed up to Basle as recently as 1905). At the same time, loess was deposited both on the margins of the plain, capping the terraces and lowest foothills, and lapping round the edge of the Kaiserstuhl, to such an extent that the bare volcanic rock appears over a very limited area. At the same time, the Feldberg in the south, and the Hornisgrinde in the north, were the centers of closed ice caps, whence the ice steamed down adjacent valleys, blocking and diverting river courses, and forming deep circular *Kare* (the Feldsee, 1,000 feet below the Feldberg is an example of such a corrie lake). Two large finger lakes, moraine dammed, also lie to the east and southeast of the Feldberg: Titisee, and the lesser known Schluchsee, the level of which has recently been raised in connection with a scheme to supply hydroelectric power to the south-central districts.

The hydrographic pattern of the highly dissected "plateau" of the Black Forest is intricate, in sympathy with the complexity of the underlying rock structure. The thinness of the stream network developed on the previous, less resistant sandstone rocks contrasts with the highly developed pattern evolved on the impervious gneisses and granites. Moreover, the valleys cut into the Bunter rocks are usually deep, narrow, and flat-floored, while those incised into the basement rocks are shallow, except where rejuvenation has occurred. A third contrast is between the generally steep, rejuvenated, abrupt valleys opening onto the Rhine Plain and the narrow, flat-floored valleys, deeply sunk into the sandstone, but of gentle gradient, draining to the upper Danube basin.

As the result of the differential uplift of the Vosges-Black Forest block in Miocene times and its tilting towards the N.N.E., the Feldberg became the focus of a radial system of streams all flowing now to the Rhine, either to the south or the west. At the same time, the progressive deepening of the Rhine valley, as the river flowed northwards,

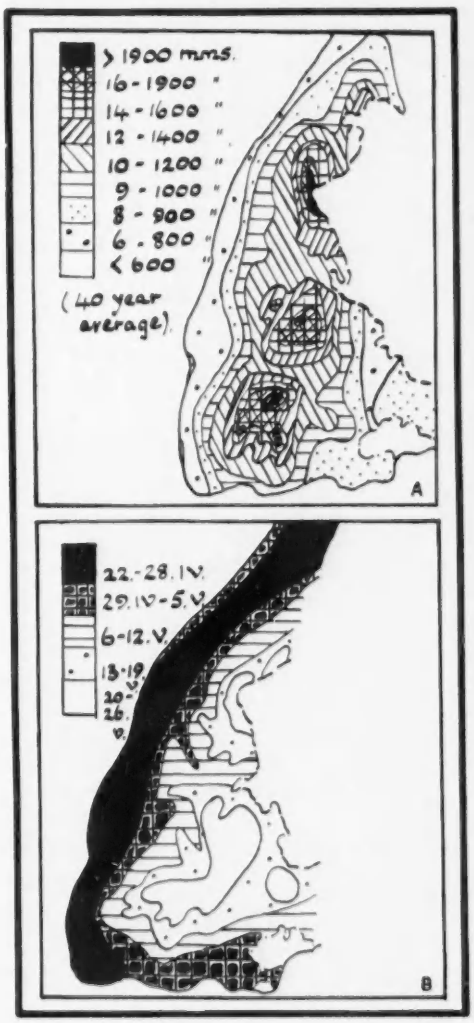


FIGURE 3.—A. Average annual precipitation. B. Average dates of the last killing frost. Like all forested highlands of central Europe the Black Forest is distinguished by localized distribution of climatic elements, consequent upon diversified relief, which is reflected in the patchwork pattern of many phases of human geography. (Based on maps in the *Heimatatlas von Baden.*)

resulted in the increased eroding power of tributary streams and the deposition of much sediment, not only in the Rhine Plain, but also in the lower ends of the tributary valleys. Another factor, which helps to explain the asymmetrical water parting between the Rhine and the Danube, which zig-zags diagonally across the Forest, sometimes to the east of the highest summits, is the unequal precipitation on the western and eastern slopes. Precipitation on the windward, i.e. the western, slopes amounts to 1,600 to over 2,000 millimeters (about 65 to 85 inches). Consequently, the area now tributary to the Danube has shrunk to the basins of the Brege and Brigach, while river capture in the case of the Wutach, with its two "elbow" bends, has resulted in further losses to the Danube.

FIGURE 4.—1. Clay loams. 2. Loess and loamy loess. 3. Marl. 4. Calcareous soils. 5. Volcanic. 6. Fluvio-glacial sand and gravel. 7. Siliceous soils. 8. Sandy soils (from Bunter sandstone). The scarcity of arable soils in the Black Forest, except for the tongues of alluvial loam which extend from the Rhine Plain into the region wherever valleys open upon it, strictly delimits agriculture. The soils are dominantly podsolic in character.

## CLIMATE

As the result of wide variations in altitude etc., there is a range of climate within the Black Forest, as Gradmann expresses it, from one suitable for the cultivation of the vine, to one supporting only meagre sub-alpine scrub and moorland above the tree line. Yet the whole region is characterized by its openness to cyclonic influences, associated with the prevalent Westerlies, especially via the Belfort and Saverne gaps. Mild, humid air, much cloudiness, especially in the summer, considerable winter snowfall and heavy valley mists, combined with abundant yearly precipitation, are the marked features of the Black Forest climate. These features are further emphasized by the trend of the mountains from N.N.E.-S.S.W., at right angles to the prevailing winds.

*Temperature.* The Black Forest resembles all the forested highlands of Central Europe in that it experiences a "mountain" type of climate, in which local factors, such as altitude, exposure, slope, etc., are as important in determining minor variations as distance from Atlantic influences and openness to "continental" winds. The annual temperature range is actually less than on the Rhine Plain, in a number of cases, e.g. that of Kniebis in the northern Black Forest which records a yearly range of 16.5 degrees C. (39 degrees F.) compared with 20 degrees C. (48 degrees F.) for stations on the Rhine Plain. Cold winters, a cool spring, delayed by the melting snow, and a mild summer, followed by an autumn warmer than spring, together with considerable daily ranges of temperature, are characteristic. In winter, the warmest sta-

tions occur on the western or southwestern slopes, while northeastern or eastern aspects are exposed to continental winds, and lower temperatures are experienced, comparable with those of the Baar to the east. Many of the deep-cut valleys suffer from severe winter frosts, especially during periods of anticyclonic calm, where cold, heavy air gravitates to the floor of the valley, causing temperature inversion. This feature may be correlated with the frequent location of farmhouses and their surrounding gardens and fruit trees on middle slopes.

*Precipitation.* Owing to its high average altitude, its exposure to the prevalent southwestern winds, the Black Forest is a region of high humidity, much cloudiness, especially in summer; bright skies and greater visibility being characteristic of the winter months. The precipitation is well distributed through the year, the region lying in a transitional position between the cool temperate, west marginal type of climate and the continental, with the result that a double maximum occurs—in December and in July. The effect of location with respect to cyclonic winds, convectional overturning during the summer, re-enforced by the mountainous character of the region, are reflected in the map showing the annual distribution of precipitation, which is, at the same time, an index to the relief of the region (Figure 3A).

The highest total precipitation occurs on the windward slopes of the Black Forest, i.e. those facing west, southwest, or south, while the amount decreases progressively on the leeward side and in the rain-shadowed vallevs of the eastern slope and center. The Hornisgrinde records the maximum—2,200 millimeters or 88 inches—while the Feldberg approaches closely with 2,000 millimeters or about 80 inches. In the central region, with a falling off in altitude, the total drops to 1,400 millimeters or less, and the eastern slope, to the leeward of the highest summits, receives only 900 millimeters or less. During the winters, snow usually lasts from September 22 until May 26 on the Feldberg, but at lower altitudes the period is of course shorter, and varies according to several factors, such as total precipitation, aspect, slope, etc., and differs considerably from year to year.

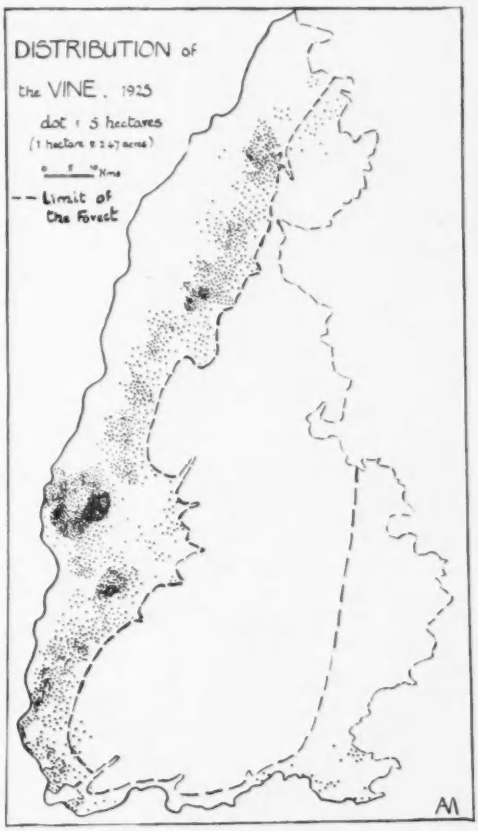


FIGURE 5.—Viticulture is confined to the peripheral sections of the Black Forest, almost entirely along the western side.

*Frost and the Growing Season.* The Black Forest lies within the zone of winter cold, which envelops central and eastern Europe for more than three months of the year, when the thermometer drops below freezing point. A contracted growing season of less than 200 days is found along the margin of

the Forest, and by mid-April the temperature of all but the lowest slopes is less than 43 degrees F., so that plant growth is still arrested. The influence of altitude, exposure, shelter, etc., are again apparent (Figure 3B), spring coming earliest in the Freiburg "bay" (April 22–28), and latest in the highest districts, and in the Baar, where killing frosts are apt to occur up to May 20–26.

FIGURE 7.—The eastern slope of the Black Forest, between Furtwangen and St. Georgen. Thick fir forests on the plateau top contrast with the land cleared for strip cultivation and pasture on the gently sloping valley sides. The accordant summit levels correspond to the uplifted and mildly dissected Miocene peneplane.

SOILS

Figure 4 shows the distribution of soils (after a map in the *Heimatatlas von Baden*), in the Black Forest and its marginal regions, based on differences in the parent rock or drift. The classification also suggests the composition of the various soil groups. Such distinction, in a region of diverse rock structure, appears more satisfactory than one based on considerations of climate alone. On this latter account, the soil groups might be classified as dark brown earths (steppe soils), found on the Rhine Plain, the Kaiserstuhl, and on the limestone plateaus and platforms covered by loess; the grey-brown earths of the timbered districts forming a second category; and the grey-earths, or the podsolized soils, which occur in the highest parts of the Black Forest, a third.

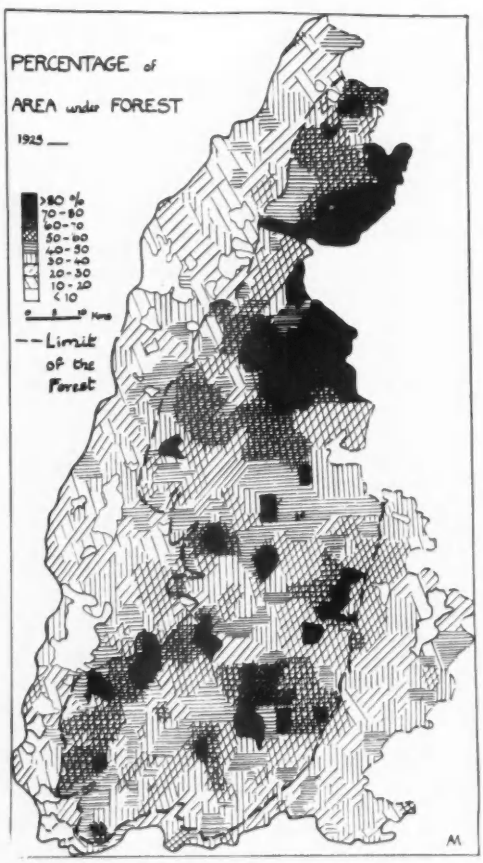


FIGURE 6.—The percentage of forest cover varies significantly and in places rather abruptly from one unit of area, the parish, to another. The factors affecting forest density constitute a complex and manifold influence, of which the several effects may not readily be distinguished.

From the point of view of land utilization, the highly tractable soils of the Rhine Plain, weathered either from the fine alluvium into a rich loam, or intermingled with loess to form a lighter, loamy loess soil, are the most valuable soils in southwestern Germany. They are intensively cultivated and are very productive; they are absent from the Black Forest, but tongues of alluvial loam, frequently intermingled with glacial drift, extend up such valleys as the Kinzig, the Dreisam behind Freiburg, and the Wiese behind Basle, as

well as up the Brege and Brigach valleys leading to the Danube. These soils provide rich meadow and a certain amount of arable land. Similarly, the calcareous soils, sometimes mixed with loess, which border the Forest and are associated with the *Muschelkalk* and Jurassic limestone outcrops, provide good pasture and arable land. They contain a medium amount of humus, are slightly leached, and are especially suitable for the cultivation of cereals, where slopes are not great (as in the Baar to the east of the Forest), otherwise they are usually under woodland (the Dinkelberg plateau), or the vine (Tuniberg and Markgräfler Hills).

Within the Forest, two types of soil predominate: those weathered from the pre-Cambrian gneisses, granites, etc., and those weathered from the Bunter sandstone. Both these soils are podsolized and contain much raw humus, and further, as the result of heavy rainfall and much leaching, they are poor in lime. Of the two, the siliceous soils, derived from the crystalline rocks and the granites, are most productive and tractable, especially where smeared with glacial drift, and they break down into a clay loam which provides good pasture and some potential arable land. On the other hand, the sandy soils appear to be the most unproductive, for their low mineral and humus content and their high porosity make them highly unsuitable for cultivation or grassland. They remain either under forest, dwarf forest, or rough pasture. In the Hornisgrinde district, for example, where the soils contain a high proportion of acid humus and the sands have a bleached appearance, the forests degenerate into scrub and poor heath. Attempts to reclaim such districts meet with little success. Only by a long-time program of growing psammophytic legumes can the sands be made fertile.

## LAND UTILIZATION

On a basis of land use, the contrast between the Black Forest and its marginal lowlands is very striking. The Schwarzwald is, of course, the most thickly forested district in South Germany—the average percentage of the forest cover is 50 (Figure 6)—and 75 per cent of the trees are conifers. To the west of the steep margin of the Forest lies "the garden of Germany," on the Rhine Plain, a region which, together with the "steppe-heath" foothill belts, has been cleared and cultivated for centuries. These are regions of rich soil, medium rainfall, and semi-continental climate. In their natural state, these

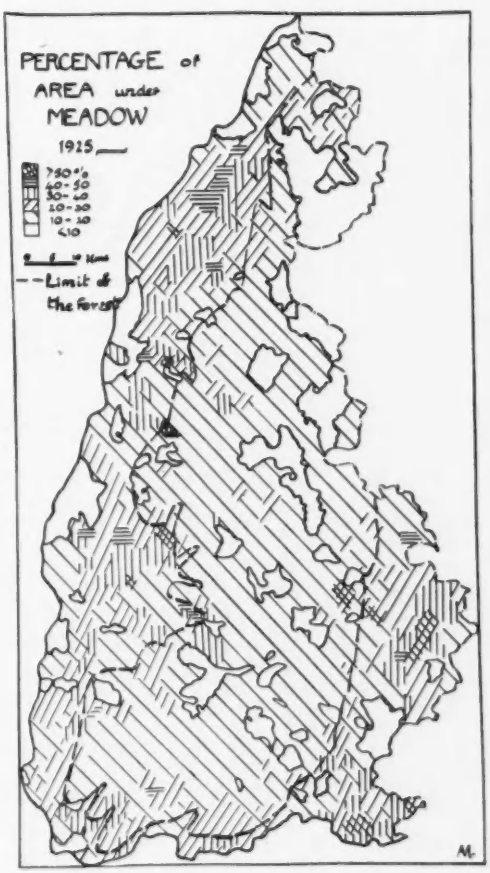


FIGURE 8.—Percentage of meadow runs relatively uniform over much of the area, except on its margins.

steppe-heaths provided originally good grazing land, but when cultivated have always proved exceptionally productive. On the steep slopes of the foothills, where originally heath prevailed, the vine now extends to about 1,200 feet, e.g. in the Markgräfler Hills, on the slopes of the Schlossberg, behind Freiburg, up the Glottertal, to the north, and of course on the slopes of the Tuniberg and Kaiserstuhl. (See Figure 5.)

A few parts of the Black Forest rise above the tree line, and above 4,000 feet the conifers become dwarfed and stunted in appearance, until they finally give way to high moor and sub-alpine vegetation. Bog plants and sphagnum are found at such heights, where raw humus has developed, but true sub-alpine flora have rather a limited distribution in the Black Forest, for comparatively little bare rock is exposed, as in younger mountainous regions of sharper land forms, and the general coloring of the Forest is everywhere green, whether the bright green of the meadow grasses or the sombre blue-green of the firs. In places where the forest gives way to heath, i.e. on the light, sandy soils, berry-bearing plants, such as blueberry, raspberry, and blackberry are found.

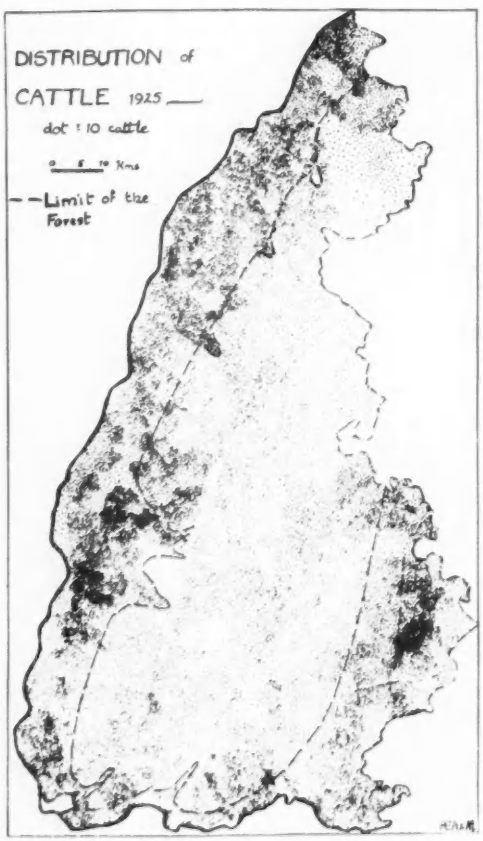


FIGURE 9.—Cattle, like meadow, become more important without the boundaries of the forest areas.

### FORESTS

Figure 6 shows the density of the forest cover on a *Gemeinde* or parish basis. The distribution which it indicates must be related to a complex set of factors, biotic as well as climatic and edaphic. It suggests that those areas which remain under forest are those which centuries of settlement and clearance have proved negative regions. They are usually those of steep slopes, high precipitation, and permeable rocks. Neumann, on page 35 of his *Der Schwarzwald*, published in 1902, estimated that the extent of the forest cover varies from 60 to 65 per cent on the sandstone areas, decreasing to 40 to 45 per cent in the center and west, and increasing again to 50 per cent on the granitic outcrops, and 45 per cent on the gneisses, but dropping to 35 to 25 per cent on the *Muschelkalk* areas. Figure 6, based on figures for 25 years later than those of Dr. Neumann, bears out his inferences. The highest densities—up to 80 per cent and over—occur in the northeast, where great stretches of almost uninterrupted forest extend up the Murg and Nagold valleys. Patches of high density also exist in the south-center, notably on the slopes of the Feldberg massif, in the Blasiwald to the southeast, and on the Blauen.

Although the typical tree of the Black Forest is the silver fir (*Pinus silvestris*),

a few larches are to be found intermingled with the firs, and the spruce on the light, sandy soils of the north. Further, although pure stands of conifers are the rule in the higher and eastern parts of the Forest, mixed stands are found on the western and southwestern slopes, the beech extending in places up to 3,000 feet, e.g. on the Kandel, the Blauen, the Belchen, etc., although the general limit of the mixed forests is about 2,100 feet. Mingled with the beech, the sweet chestnut is found on the foothills of the Forest, e.g. around Freiburg. In the north, on the sandy soils, the beech does not extend above 1,500 feet. (Gradmann, *Süddeutschland*, Vol. II, p. 68.) Throughout the Black Forest generally, the tendency has been for the area under forest to decrease through the centuries, as the result of continual cutting. This progressive clearance of trees, now offset by scientific planting, has been with a view to providing timber for a variety of purposes, e.g. for fuel, building material, forestry industries, such as wood carving, the making of farm implements and household utensils, as well as for the export trade to such regions of deficiency as the Rhine delta lands. In addition, a considerable proportion of the originally forested land has been cleared to make room for settlement and pasture land or cultivation. A consideration of this process and development of the forestry industries is felt to be out of place here.

### PASTURE LAND

Owing to various factors already enumerated, such as high prevalent humidity, preponderance of thin, leached, and often porous soils, topographic unsuitability of much of the forest land for cropping when cleared, the Schwarzwald is, apart from the forests and their utilization, a region given up to grazing economy (*Graswirtschaft*). In contrast with the forest density map, that of the pasture land shows striking uniformity (Figure 8), most of the region providing 10 to 20 per cent pasture. The map should be correlated with that showing the distribution of cattle (Figure 9). The highest proportion of land under pasture shown on the map is actually outside the Forest proper, e.g. on the Rhine Plain, and also on the marginal areas, e.g. the Baar, and the Upper Rhine valley. The deep-cut valleys leading from the Forest on the Rhine Plain provide some of the richest grazing land within the region. Here the meadow grasses are covered by snow for several weeks of the year, and in the spring they are likely to be flooded by streams coming down in spate. Even

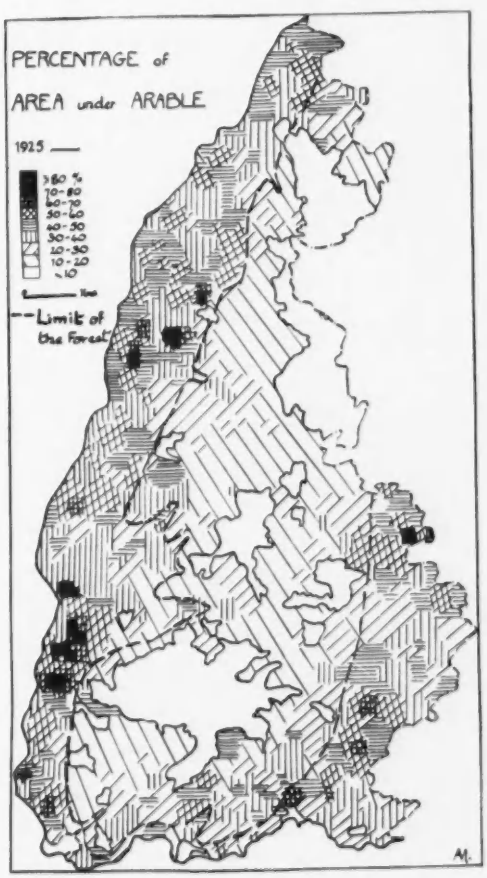


FIGURE 10.—Very little of the land within the forest proper is arable; along the margins the percentage increases appreciably.

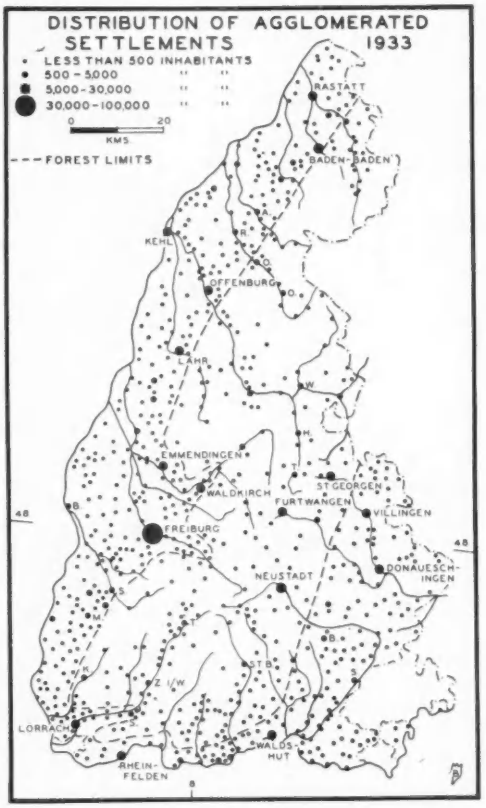


FIGURE 11.—Density and distribution of settlement in the Black Forest reflects the character of the terrane and related attributes of the area, as well as the way in which routes of movement and development of industry has affected the pattern of occupance.

in the heat of summer, dew and rain showers are sufficient to maintain the freshness of the pastures, and drainage channels, cut contourwise, serve to carry off surplus moisture.

Within the Forest, then, the first choice of the land, once the trees are cleared, is for pasture. There is an economic, as well as a physical, explanation of this feature, for, apart from the increasing demands for dairy produce in the urban centers, the seasonal tourist traffic creates a further market, especially in such noted resorts as Triberg, Furtwangen, St. Georgen, St. Blasien, etc. Otherwise, owing to lack of transport facilities, small size of the farms, poor quality of the herds, and absence of an efficient, e.g. coöperative, system of marketing dairy produce, very little is sold outside the region. The cost of rearing dairy cattle to the impoverished Black Forest peasant is further increased by the need for winter stall feeding (and also it would appear during the hottest part of the day in summer, when the cattle are brought in from the glare of the fields). Hay is the chief fodder crop available, although a few farms grow a certain amount of clover. Other feedstuffs have to be bought. The high pastures of the Feldberg and the adjacent heights, known locally as *Wasen* are used for summer grazing of young and store cattle, a small scale example of transhumance. Cattle sheds are erected here as shelters for the cattle and as hay stores, and not for the making of cheese as in the Swiss Alps. A similar practice is found in the Allgäu region and the Western Tirol.

### ARABLE LAND

The area under crops in the Black Forest is very limited, great tracts in the Feldberg and Triberg regions, and in the northeast recording less than 10 per cent, slightly higher figures being reached over the remainder of the Forest, but chiefly between 10 and 20 per cent. An interesting correlation may be made between the chief arable districts and the 2,000 foot platforms, e.g. around the villages of St. Peter and St. Märgen (Figure 13). Here potatoes, rye, oats, and clover are grown, the land reverting to pasture after a few years. This system, which is practised in various parts of southern Germany, e.g. in the Allgäu, Upper Bavaria, and the scarplands of Swabia and Franconia (see maps in Gradmann, Vol. I, pp. 136–7), is the alternative to *Feldgraswirtschaft* (pastoral economy) and is known as *Egartenwirtschaft*. The ubiquitous strip system (Figure 13) ap-

pears uneconomic, but over-division of land holdings is one of the problems of the Black Forest, and it arises over the local system of inheritance. The length of the strip may be the most convenient from the point of view of the day's ploughing (the analogy between the English "furlong" and the continental "Morgan"), and topography is also a compelling factor in the location of the arable land, in a region of steep, but rounded, slopes. A great deal of hand labor must, therefore, be employed, e.g. in sowing, hoeing, weeding, and harvesting, and the most suitable land for cropping is found wherever local flats and bevelled surfaces occur, and sometimes the rounded shoulders of the valley sides are cultivated. Rye, potatoes, and oats, together with a little rape and clover are the only crops, on account of climate, topography, and soil, and black bread is the staple foodstuff of the Black Forest peasant. Rye, which will grow on poor, sandy, and siliceous soils, where rainfall is heavy, is found up to 1,050 meters in the south, and is also widespread in the north, where the amount of land suited to crop farming is extremely limited.

## PART II: SETTLEMENTS AND INDUSTRIES

The Black Forest has always exercised a centrifugal influence on population distribution, but the average density of population, especially in the south (between 25 and 50 to the square kilometer), is fairly high for a largely forested highland district. Figure 11 shows the distribution of agglomerated settlements. These are either small industrial centers, with a population between 500 and 5,000, such as Schopfheim, Neustadt, Hornberg, etc., or they are health resorts, such as St. Blasien, Badenweiler, or they may combine both functions, as in the case of Triberg, St. Georgen, and Furtwangen. The other sites marked correspond to villages with less than 500 inhabitants. These are most thickly spread on the southern slopes of the Forest, on the heights above the valleys leading south to the Rhine, and by the side of streams such as the Wutach, Schwarza, Alb, Wehra, and Wiese. In the valleys opening westwards on the Rhine Plain, a number of villages are found, e.g. up the Elz, Kinzig, Rench, and Archer valleys, and also on the flat floor of the Dreisam behind Freiburg. The bevelled plateau top, on the western margin of the Forest, also provides suitable sites for villages, especially the medieval monastic type, well

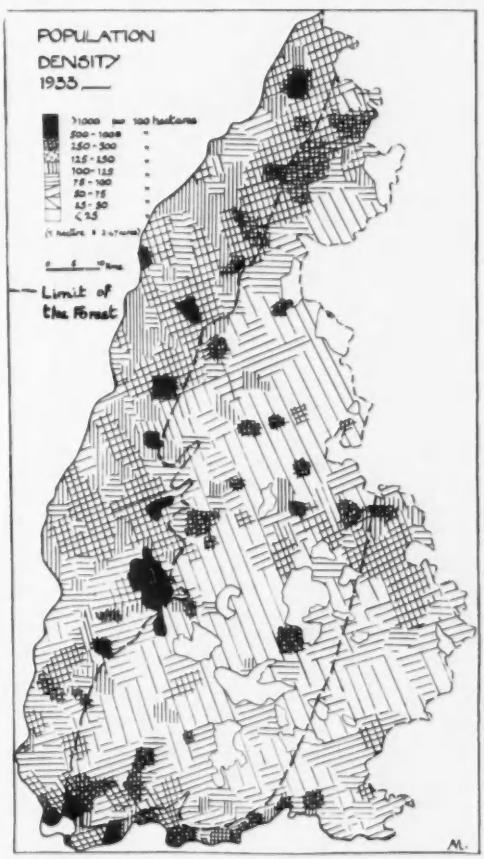


FIGURE 12.—Density of population is roughly inverse to density of forest cover, and is rather closely correlative with the distribution of industry.

exemplified by St. Märgen and St. Peter. Otherwise, settlement is sparse on the steep dissected western slopes of the Forest.

The northern Black Forest, apart from the deeply incised Murg valley, is a very thinly populated region, the sandstone heights being practically devoid of settlement, which remain largely under forest. On the other hand, on the long, gentle eastern slope, there is a fairly thick spread of villages, but the increase immediately to the east of the Forest, in the limestone country of the Baar is even more noticeable. In the central region of the Forest, the largest number of villages occurs within the highly broken but yet accessible region of the Feldberg massif. On the slopes, above the water meadows of the deep cut valleys, stand such resorts as Hinterzarten, Todtnauberg, Altglashütten, and Hammereisenbach, together with Titisee and Schluchsee, above the lakes that bear their name.

Although a number of villages and hamlets occur in the Black Forest, e.g. where routes converge, where there is access to spring water, water power, etc., or where an early monastic foundation has provided a nucleus, the most typical form of rural settlement is, perhaps, the isolated farmstead (*Einzelhof*). These are usually to be found where well-drained sites are available, either at the heads of valleys, or on the middle slopes. (See Figure 15.) Such farms avoid the temperature inversions often experienced during winter on the floor of the valley. Other sites are shoulders and flats, where the land may be of sufficiently gentle gradient to enable crops to be grown. The essential elements in a Black Forest farmstead are always a certain amount of water meadow for cattle grazing on the often narrow valley floor; pasture land on the steep slopes; a limited amount of arable land, where gradient permits, e.g. on spurs and local flats; with communal woodland above. (See Figure 15.)

FIGURE 13.—Black Forest cattle grazing on the flat upland pasture land near St. Peter. Strip agriculture appears in the middle distance and the Feldberg massif in the background. Deep cut valleys, with wooded slopes and deeply incised into the permo-carboniferous peneplane are apparent. (Courtesy of Miss D. Edmond.)

### URBAN SETTLEMENTS AND THEIR DISTRIBUTION

Reference again to Figure 11 shows that, with the exception of the industrial centers and tourist resorts of the interior

of the Forest, the large towns are all marginal to the Forest proper, and. even then, Freiburg-in-Breisgau is the only urban center which approaches a population of 100,000. The remainder have a population varying between 30,000 and 5,000. One main line of settlement corresponds to the foothill towns. such as Offenburg, Lahr, Emmendingen, and Staufen, which stand where a tributary valley opens onto the Rhine Plain, linking highland and lowland, at a point where the main road and railway run northwards from Basle to Mainz and Cologne.

In the Upper Rhine valley, there is an almost continuous line of small industrial towns, marginal to the Forest, and extending eastwards from Basle to Waldshut. Grenzach, Wyhlen, Rheinfelden, Schwörstadt, Säckingen, and Kleinlaufenburg are examples. These towns stand at the southern foot of the steep hills of the Dinkelberg plateau and Hotzenwald, where small tributaries join the upper Rhine, providing originally water power sites. Today, apart from the recently completed Schluchsee scheme, the largest centers for transmission of hydroelectric power are at Riburg-Schwörstadt and Rheinfelden, and these plants supply the chemical and aluminium works at Rheinfelden, and also the silk and cotton mills, the metallurgical and woodworking factories of the southern Black Forest.

### INDUSTRIAL CENTERS OF THE BLACK FOREST

The manufacturing centers of the Forest proper are limited to the east-central district, the Gutach valley in the center, and the Rench, Elz, lower Wiese, and upper Wutach valleys. St. Georgen and Villingen lie in the Brigach valley, and Furtwangen in the Brege, both of which converge on the Danube at Donaueschingen. St. Georgen, with a

FIGURE 14.—Harvesting the hay crop on the Lindenberg, near St. Peter. The cart and wooden cane "cradle" attached to the scythe are special features.

population of over 5,000, combines the functions of a high altitude health resort, a winter sports center, and a small manufacturing town. It is linked to Triberg and Villingen by the Black Forest railway, an engineering feat which, incidentally, provided the model for the St. Gotthard line. The railway provides a diagonal route through the central Black Forest, and, by a series of spirals and tunnels, pierces the Rhine-Danube watershed at 2,730 feet. The line brings a good deal of tourist traffic to the central districts of the Forest and also provides a means of transport for the manufactures of such towns as St. Georgen and Triberg. St. Georgen is especially associated with the clock-making industry and also with various branches of the metallurgical trades, which originally developed from the clock industry, such as the making of clock machinery, in the same way as the enamelling trade began with the painting of clock faces and figures, and now includes the enamelling of tin plates, e.g. for advertisements. Similar industries are found in Triberg, especially noted for its clocks, machine parts, and more recently for chromium plating. Sawmilling is also active in the Gutach valley, between Triberg and Hornberg with its porcelain industry (See Figure 17).

Neustadt, in the Gutach valley (the upper Wutach) is another small indus-

trial center, concerned with sawmilling, paper making, and clock manufacture. Access to water power and to local timber—the town is almost encircled by forested hills—has been the main factor in the growth of industrial activities here. Neustadt is located on the railway which links Freiburg with Donaueschingen, the main route through the southern Black Forest, via the Höllental. Some 12 miles to the north is Furtwangen, in the Brege valley, a noted center of the clock-making industry. Other industrial centers are found farther north, e.g. at Wolfach, in the upper Kinzig valley, a small woodworking and metallurgical town. Waldkirch, in the lower Elz valley, north of Freiburg, has a variety of small-scale industries. They include the manufacture of musical instruments, such as church organs, music boxes, etc., and also the cutting and polishing of precious and semi-precious stones. Sewing cotton is also made here and at Kollnau. In the Rench valley, Oppenau has a number of sawmills and a chemical industry, while Oberkirch is chiefly concerned with woodworking, papermaking, and metallurgy.

The Wiese valley, which opens southwestwards from the Forest onto the Rhine Plain at Basle, is the most continuous industrial region in the Schwarzwald, and a chain of manufacturing centers, gradually decreasing in size, extends from Lörrach, a German suburb of Basle, to Todtnau, near the Feldberg. This industrial region includes, in addition to the centers in the Wiese valley, such as Schopfheim, Zell and Schönau, such outlying places as Kandern, to the north of Schopfheim, and Weil and Wyhlen, industrial suburbs of the Basle conurbation. Although these settlements had developed a variety of industries by the middle of the 19th century, such as sawmilling, paper making, the manufacture of brushes, spoons, matches, etc., the spinning and weaving of textiles, using flax, wool, and silk as raw materials, their main concern today is with the textile trades. The introduction of cotton and silk spinning and weaving was due to Swiss initiative and capital, and, economically, the region is one with the Basle conurbation and the textile centers of the Swiss Foreland. Similarly, in the upper Rhine valley, the industry has developed irrespective of

FIGURE 15.—Isolated farmsteads on the eastern slope of the Black Forest, at the head of the Eisenbach valley (Danube drainage). Open pasture land predominates in a region of gentle gradients, while some strips of cultivated land on the rounded middle slopes and extensive fir plantations are to be seen, the latter mainly on the plateau top.

the existence of the frontier, and Grenzach, Rheinfelden, Säckingen, and Waldshut are also engaged in the textile trades, but chiefly in manufacture of silk and artificial silk, whereas the Wiese valley is mainly concerned with production of cotton goods, although some silk and recently artificial silk manufacturing is undertaken, together with the making of textile machinery, as at Zell. The other important industry of the upper Rhine valley is the manufacture of chemicals and aluminium, e.g. at Rheinfelden, based largely on access to hydroelectric power. This latter industry is also of Swiss origin, being a branch of the aluminium works at Neuhausen which derive their electrical current from the Rhine Falls at Schaffhausen.

### EVOLUTION OF INDUSTRIES

The pre-factory phase in the industrial development of the Black Forest dates largely from the 18th century, when a number of fresh settlers arrived concerned with the exploitation of the forest resources. Iron smelting, charcoal burning, the making of tar and pitch, together with the extraction of resin were long established industries, which were further developed, although mining declined. Moreover, new industries grew up, especially those using wood as raw material, e.g. in the making of vine stocks, farm implements, shingles for roofing, etc. Triberg, especially came to be noted for its wood carving and also for its straw plaiting, as a basis of basket weaving and hat making, while wooden and metal spoons were made in the Feldberg district, e.g. at Löffelhäuser, a hamlet near Todtnauberg. The making of brushes, clocks, and wood carving were possible winter activities when farm work was at a standstill, and also provided an additional source of remuneration in a region mainly of subsistence farming.

Water power, in a region abundant in timber, the chief raw material, seems to have been a major factor in the growth of early industries. The very large number of sites where a small head of power is available, sufficient to drive simple machinery, serves to explain the highly scattered nature of these rural activities. This feature is still characteristic of the forestry industries, and to a slightly less extent of the metallurgical trades. The manufacture of textiles, especially cotton and silk, although still

FIGURE 16.—The rich farming country of the Breisgau between the Tuniberg and the Kaiserstuhl. Maize is the crop on the left and is also the load on the ox wagon. Loess is the soil formation here and is easily ploughed. Apple and almond trees border the roadside.

largely dependent on access to water power, owing to the essential need to import raw material, has become more restricted in distribution, i.e. to the Wiese and upper Rhine valleys, and, on a small scale, to the Freiburg-Emmendingen and middle Kinzig region.

The transition from the domestic phase to the organization of industries in factories took place during the 19th century, but it became speeded up after the the Customs Union (*Zollverein*) in 1836, which opened a market for all kinds of manufactures all through Germany. Soon after, the coming of railways and improved roads revolutionized transport facilities, with the result that most of the typical Black Forest peasant

FIGURE 17.—Sawmill in the Gutach valley, between Triberg and Hornberg, in the central Black Forest. Logs are floated downstream to the mill, where hydroelectric and also steam power are used. The mill is in the center of a thickly forested district.

industries are now carried on in factories run on mass production lines. The clock industry (the products of which are known throughout the world) is a good example of this change in organization. Figure 18 shows that the chief centers of the industry today are St. Georgen, in the upper Brigach valley, Furtwangen, near the head of the Brege, Villingen, to the east of the Forest, and Triberg, near the source of the Gutach. Actually, the making of clocks dates back to 1680, when the first Black Forest clock was made, using wooden wheels, to be followed by cuckoo clocks in 1720. During the 18th century, when pendulum clocks were introduced and also metal works, the industry was widely scattered through the Hochschwarzwald, and was still largely a domestic one or else carried out in small works, in the same way as the glass-blowing and straw-plaiting industry. The development of an export trade, not only with other parts of Europe but also with America, brought further stimulus to increased output, although the first large factories were not established until after 1850.

A subsidiary industry to that of clock making was the production of bells and toy parts, which led to establishment of the musical instrument trade. By 1784, the making of barrel organs had begun in Waldkirch, and a number of small establishments were later set up in Furtwangen, Lenzkirch, and Triberg. In the same way, the jewelry trade developed in Pforzheim, as an offshoot of the clock industry, which itself owed its origin, in this case, to Swiss initiative, and both were concerned with a growing export trade with the countries of western Europe and America. Similarly, the stone cutting and polishing industry grew as a useful adjunct to the clock trade, e.g. in Pforzheim, although elsewhere, as in Waldkirch, it began with the cutting of local garnets.

The origin of the metallurgical trades, now widely dispersed through the Forest, began with the smelting of metal by means of charcoal in the Middle Ages. A certain amount of iron ore was formerly mined in the Kinzig valley, and on the eastern side of the Forest, around Hammereisenbach. Exhaustion of local ores, and lack of coal for coking in Baden, were serious handicaps to further development of metallurgy, but, nevertheless, the last census of industries showed that today the various branches

FIGURE 18.—The centers of clock-making are localized in a relatively limited area about St. Georgen and Villingen. Black Forest clocks are famous throughout the world, particularly cuckoo clocks.

of the metal trades (including the making of machinery, machine parts, electrical apparatus, optical and musical instruments) form the largest group of industries in Baden. (*Die Industrie in Baden*, 1926.)

The beginning of the textile industry, today the second manufacturing activity of the region, according to the number employed, dates from the 18th century, a factory for the manufacture of Indian cottons being set up in Lörrach in 1753, to be followed by a cotton spinning and weaving mill at Schopfheim in 1755. On the whole, the textile trades seem to have had little foundation in the domestic spinning and weaving of wool or flax, the mills in Schönau, Säckingen, and Waldshut making cotton from the start. At the beginning of the 19th century, there were some linen mills in southwest Germany, e.g. in the towns of the Wiese valley and in Emmendingen, but, since the rich, damp pastures of the Black Forest are valuable for cattle rather than sheep, the amount of local wool has always been negligible. The most potent factor in the establishment of the textile industry in southwest Germany seems to have been the existence of a surplus of rural labor, of an adaptable type, the availability of water power and also soft water at a number of sites. In some instances local skill, e.g. in the making of special silks and ribbons used in traditional costumes, such as those of the Markgräfler district, could be adapted to factory work, as in the case of the silk industry of Kandern. However, in the Basle-Lörrach conurbation, the stimulus of kindred Swiss industries, such as cotton and silk spinning and weaving, embroidery work, etc., seems to have been the chief factor in the hub of the textile trades in Baden. The textile industry of the Black Forest engages some of the most skilled help of the region; the number of unskilled is small.

### DISTRIBUTION OF THE CHIEF MANUFACTURING INDUSTRIES

Table I gives a list of the major groups of industries in Baden, and it serves to illustrate two chief features: their small size and considerable variety. It is not possible to quote figures for the Black Forest area alone, nor are more recent figures available.

Of the total population of Baden, about 2.3 million, only 11 per cent is engaged in industry. The highest proportion of the population so occupied is found in the southwestern part of the state, close to the Swiss frontier, e.g. in Amt Schopfheim, Säckingen, and Lörrach, all recording more than 17 per cent. Pforzheim returns 20 per cent, and some of the districts on the margin of the Rhine Plain and the Forest, such as Lahr, Waldkirch, Rastatt, and Offenburg, over 10 per cent. Within the

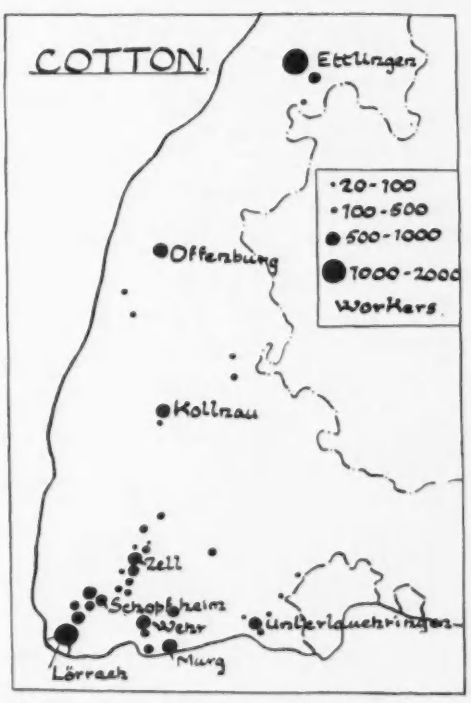


FIGURE 19.—The cotton industry is most highly developed in Ettlingen, Offenburg, Kollnau, and Lörrach.

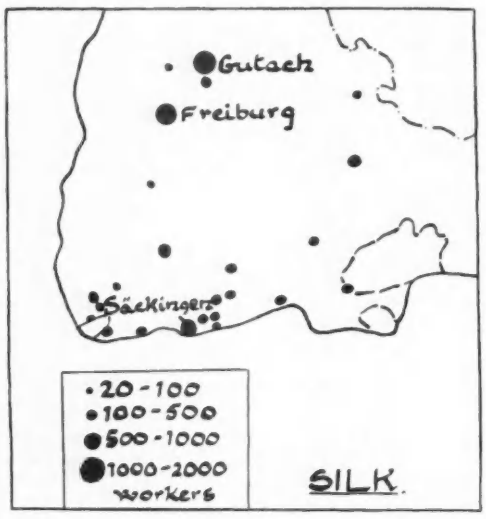


FIGURE 20.—Gutach, Freiburg, and Säckingen form the major centers of the silk textile industry.

Forest proper, the percentage is everywhere lower, only the districts which include such large industrial centers as Wolfach, Neustadt, and Waldshut recording more than 7 per cent. The proportion is much lower elsewhere, and even Freiburg, the chief cultural and ecclesiastical city of southwestern Germany, with growing industries, returns only 4 per cent.

### METALLURGY

The many branches of the metal trades represented in Baden form the largest group of industries, both according to total number of establishments and number of people employed. They include the making of machinery, machine parts and tools, electrical apparatus, clock works, musical and optical instruments, etc. Figure 21 shows the distribution of the chief centers. They include Rastatt and Pforzheim in the north, noted for the reduction of ores, especially gold and silver in the latter town; the making of castings at Schonach, near Triberg, and also at St. Georgen; machinery and machine parts at Triberg and St. Georgen; aluminium at Rastatt, Teningen, Singen, and Rheinfelden, an industry which is growing rapidly, and dates from about 1912. Rastatt also carries out steel rolling. Villingen and Schramberg are similarly concerned, the former town, like St. Georgen, making also clock parts and machinery.

*Lighter branches of the metal industry* are represented by the making of screws and wire, a trade subsidiary to electrical engineering and clock and musical instrument making. This industry which began with the making of wooden screws for the clock trade, e.g. at Falkau and Triberg, is still found in these centers, and also in Neustadt, St. Georgen, and Lahr. Small metal fittings, such as bells, are made in Villingen, St. Georgen, Vöhrenbach, etc., locks in Freiburg, and cutting tools in Pforzheim and Rastatt. The enamel plating of tin sheets has been undertaken in St. Georgen since about 1840, and now includes all branches of the trade, in addition to the enamelling of clock faces.

*The precious metal and jewelry trades* center in Pforzheim, in the vicinity of the Maulbronn Gate, to the north of the Black Forest. This town, which is one

TABLE I

| *Groups* | *No. of Establishments* | *No. of Workers in Factories* | | | *No. of Domestic Workers* | | | *Total No. Employed* |
|---|---|---|---|---|---|---|---|---|
| | | *Men* | *Women* | *Total* | *Men* | *Women* | *Total* | |
| | | (Figures in 1000s) | | | | | | |
| Metallurgy | 780 | 78 | 17 | 95 | .21 | .19 | .40 | 96 |
| Textiles | 192 | 15 | 23 | 38 | .13 | .72 | .85 | 40 |
| Wood Working | 253 | 13 | 2 | 15 | .00 | .08 | .08 | 16 |
| Paper | 110 | 9 | 4 | 13 | .00 | .27 | .27 | 14 |
| Quarrying, etc. | 198 | 12 | 1 | 13 | ... | ... | ... | 13 |
| Chemicals | 50 | 6 | 2 | 8 | ... | .. | ... | 8 |

Extracted from *Die Industrie in Baden*, 1926.

of the most noted centers of the jewelry trade in the world, specializes in the production of gold and silver ware, watches, ornaments, etc. These industries make a maximum demand on skilled labor and use a minimum of expensive raw materials, while producing high-priced articles for a limited market. The industry, which originated in the 18th century, under Swiss stimulus, finds the market for its products largely outside Baden, and, in fact, Germany.

*Clock Making.* This industry, together with the making of musical instruments, is perhaps the best known of the activities of the Black Forest. It employs more than 7,000 workers, 21 establishments employing more than 100 people, out of a total of 65 firms. The industry is located in three chief centers (Figure 18): they are in the east-central Black Forest, in Furtwangen, St. Georgen, Villingen, and Triberg, where 44 of the factories are situated. In addition Pforzheim contains 15 establishments, but these are all small and mainly concerned with the making of gold and silver watches, clock cases and keys, chains, and goldsmith's work generally. A third minor region is represented by the Upper Rhine valley, where Weil and Säckingen make watches and clocks, an industry which may be regarded as an extension of that of the Swiss Foreland.

As the Black Forest industry is mainly designed for tourist and export trade, the firms are large, since mass production is the rule, and little of the work (except the carving) is now done by hand. The range of products is very wide, varying from production of the simplest and cheapest clocks, turned out by the hundred, e.g. in Villingen, St. Georgen, Triberg, and Schönwald, to the most precise and expensive models, e.g. in Pforzheim and St. Georgen. The former industry developed rapidly at the end of the last century, beginning in centers, such as St. Georgen, long associated with the carved clock and cuckoo clock trade. Villingen began with alarm clocks, an industry which had to face severe American competition. Most of the factories are located with convenient access to water power, drawing originally on local skilled labor, and using pine wood and sometimes beech as raw material. The industry has been rationalized somewhat in recent years, in view especially of the curtailed export trade.

*Musical Instruments* are made in 11 factories in the Black Forest, employing in all over 500 people. The industry was established in the 18th century, as a by-product of the clock trade. It is located chiefly in Furtwangen, Vöhrenbach, Kirnach, Lenzkirch, Triberg, and Waldkirch. No factory employs more than 30 workers, but there is a considerable export trade especially with

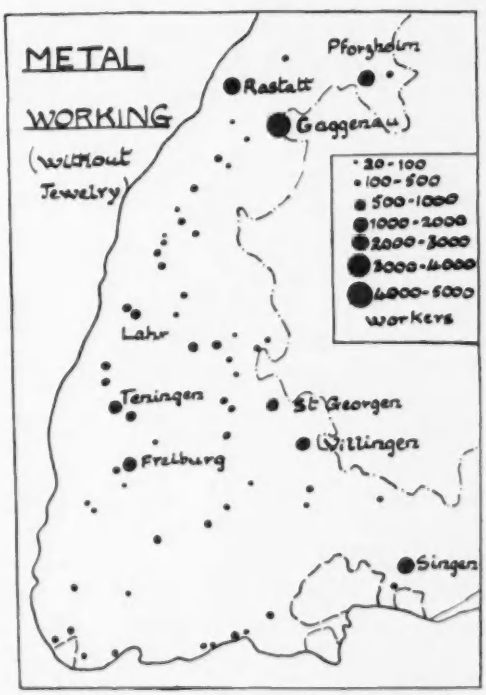


FIGURE 21.—Metal working is fairly well distributed over the Black Forest region though the largest industries are situated in the northern sections about Gaggenau, Rastatt, and Pforzheim.

America. The largest firms are to the east of the Forest, e.g. that of Hohner, in Öfingen, near Donaueschingen. Freiburg and Offenburg have piano factories, and Waldkirch makes church organs, electrical player pianos, music boxes, etc.

### TEXTILES

The distribution of the textile centers of the Black Forest is much more restricted than that of the metal industries. The four main regions in which spinning and weaving mills are to be found are the Wiese valley, northeast of Basle; the Upper Rhine valley; the Freiburg, Emmendingen, Waldkirch district; and the Gutach valley in the central part of the Forest. In the establishment of the mills, access to soft water for use in the bleaching, dyeing, and printing processes, appears to have been as important a consideration as water power for driving machinery. The catchment area of the Wiese valley, the most important center of the textile industry, is mainly composed of impervious, granitic rocks; the *Muschelkalk* of the Dinkelberg Plateau lying to the south and not providing any significant surface drainage. The usual sites of the mills are where there is a steep drop in the gradient of the valley, e.g. at Kollnau; where valleys open onto the Rhine Plain, as at Offenburg and Lörrach; or where the stream can be used for power by regulation, as in the Wiese valley (Figure 23).

It is characteristic of the industry that it has remained in small centers, using hydroelectric power rather than steam, with access to rural labor, good transport facilities, for both the import of raw material and the export of the finished goods. Lörrach is the hub of the industry in the Wiese valley, and has ten firms employing more than 2,500 workers. Here all branches of the industry are represented, including spinning, weaving, bleaching, dyeing, and printing of cotton, silk, and artificial silk. From this center, a string of places, gradually decreasing in size, extends up the Wiese valley, via Schopfheim, Zell, Schönau, to Todtnau, near the foot of the Feldberg. Here cotton, imported via Hamburg and the Rhine valley from America and Egypt, is spun and woven into a variety of materials, some mills, e.g. in Zell, specializing in damask cloth, woven on Jacquard looms. The most acute depression seems to be in such branches of the textile trades. The artificial silk

FIGURE 22.—Metal working factories in the Gutach valley, below Triberg. Note access to hydroelectric power, thick fir forests, and a main road and railway.

FIGURE 23.—Cotton mill at Hausen in the Wiese valley. The river has been "regulated" here to provide power. The main road and railway linking the industrial centers of the valley with Basle-Lörrach pass close to the factory.

industry, and also the spinning and weaving of pure silk are less important here than in the Upper Rhine valley centers, such as Säckingen, Rheinfelden, and Waldshut, where cotton takes second place. Similarly in the Freiburg-Emmendingen-Waldkirch region, silk and artificial silk manufacture are the most important branches represented, while Waldkirch is especially noted for embroidery thread. In the Gutach valley centers, i.e. Triberg, Hornberg, Wolfach, and Schiltach, only cotton goods are made.

### WOOD WORKING

In view of the facts that Baden is one of the most thickly forested states in Germany (39 per cent of the total area is under forest), and that the multiplicity of mountain streams of steep gradient, provide sites for many sawmills, the number of such mills is naturally enormous, and they are widely scattered through the Forest. They are often small undertakings, worked by water wheels, but in contrast there is the modern sawmill, in which steam power is sometimes used as an adjunct to electricity (Figure 17), and which have come to be erected through the improvement of transport facilities in the Forest, widening the market for sawn timber, especially since the construction of the Black Forest railway (timber was formerly floated down the Murg to the Rhine). The chief centers of the timber trade are found here, where not only is the timber sawn into required lengths and prepared for use as sleepers, telegraph poles, electricity standards, etc., but wood pulp is also made, e.g. in Gernsbach, an important center for paper making. Other branches of the woodworking trades include the making of an endless variety of wooden articles, e.g. packing cases, coach work, parts of brooms, brushes, clock cases, beehives, furniture and household utensils, etc. Villingen, Triberg, and Hornberg have a number of woodworking establishments, and there are several small centers scattered through the central districts of the Forest and in the upper Wiese valley. In many instances, the industry originated as a winter occupation for the Black

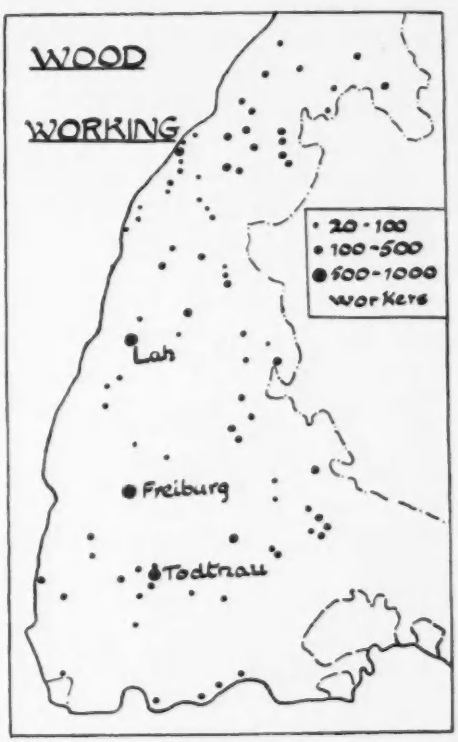


FIGURE 24.—As might be expected, the woodworking crafts are distributed with considerable uniformity throughout the Black Forest.

Forest peasant farmers, providing an additional source of remuneration. This is especially the case in the upper Wiese valley, where, a hundred years ago, brush and match making were home industries, e.g. in Todtnauberg, Brandenberg, and Todtnau. This industry is now only to be found in Todtnau, and the raw materials, such as horn, tortoiseshell, bristles, etc., are imported. The making of wooden and metal spoons, formerly undertaken in several villages around the Feldberg, e.g. in Löffelhäuser, Todtnauberg, has now completely died out.

### QUARRYING, GLASS MAKING, ETC.

Pottery making, granite quarrying, cutting and polishing, porcelain manufacture, glass making, and the cutting and polishing of precious and semi-precious stones are the chief occupations under this heading. Apart from the pottery industry of Zell, the making of porcelain in Hornberg, and plate glass in Offenburg, the chief industries within the Black Forest are granite cutting, e.g. at Bühl, south of Baden Baden, glass making, and stone cutting and polishing. The manufacture of glass, an industry which arose in the Forest in the late Middle Ages, and developed rapidly in the 18th century, is now found in Gaggenau, in the Murg valley, in the neighborhood of the Schluchsee (cf. Alt- and Neuglashütten), near Villingen, and Neustadt. Here table glass is made. The cutting and polishing of semi-precious and precious stones, an industry which began with the working of garnets in connection with the clock trade, now depends on imported stones, some of which are synthetic. Waldkirch, in the lower Elz valley, Zell, in the Wiese valley, St. Blasien, north of the Hotzenwald, and Pforzheim are the chief centers. The industry depends on highly skilled labor and is carried out in small workshops.

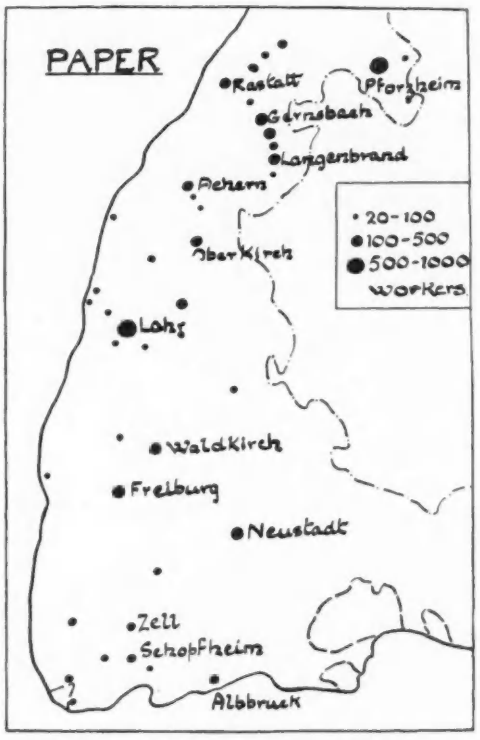


FIGURE 25.—Like woodworking, the paper industry is well spread over the Black Forest, with major centers of activity at Lahr and Pforzheim.

### CHEMICAL TRADES

The manufacture of heavy chemicals, aluminium, and artificial fertilizers in southwestern Germany is a development of the 20th century. Formerly small establishments made madder and other dyes, lead acetate, saltpeter, and potash salts, etc., only to be eclipsed by the competition from aniline dyes, *Kali* salts, etc. Rheinfelden is the chief center of the large-scale chemical industry in southwestern Germany, largely on account of accessibility to hydroelectricity, used in the reduction of gold and silver ores, in the making of fertilizers, such as ammonium sulphate, sodium nitrate, etc., and especially in the manufacture of aluminium from imported bauxite. This latter industry, which superseded diamond cutting at the end of the 19th century, is an offshoot of the Swiss counterpart at Neuhausen (deriving

power from the Rhine Falls at Schaffhausen). Electro-chemical works are also located in Waldshut, where nitrate of lime is made; while Rhina makes artificial nitrates by electrical methods and synthetic nitrogen from the air, power being derived from the plant at Laufenburg, on the upper Rhine.

## CONCLUSION

During the past hundred years the Black Forest has seen a general decrease in the earlier uninhabited areas. These persist in the region of the Feldberg massif, in the Schauinsland district, in the region of the Blauen and Markgräfler Hills, the thickly wooded Hotzenwald in the south, and in the sandstone heights of the center and northeast, especially along the Wurttemberg boundary. In a few districts, marked increases in population have taken place; these are mainly owing to the development of the tourist centers, health resorts, and small industrial towns or villages. Further, in the lower Wiese and Dreisam valleys, where crop farming and dairying are important in relation to adjacent urban markets, the rural density has increased. Nevertheless, in spite of the depopulation of some of the rural districts, due to the general low standard of living of the Black Forest peasant and the consequent migration into the more prosperous Rhineland and the industrial towns, together with emigration into other parts of Europe and overseas, the Black Forest shows rather remarkable stability and a high average population density for a forested highland district. The average density is about 65–120 people to the square mile, a figure which suggests that there are important factors checking large-scale depopulation. These may be summarized as being chiefly the considerable development of industry *within* the Forest, the importance of the tourist industry, and, fundamentally, the character of the Allemannish peasant, who is at times a pastoralist, a farmer where possible, and a workman in the forest.

# TRENDS OF PHILIPPINE SUGAR PRODUCTION

*Alden Cutshall*

IT IS reported that Magellan found sugar cane growing in the Philippine Islands at the time of their discovery (1521), but commercial production remained relatively insignificant until over three and one-half centuries later. This condition was probably due to the Spanish monopolistic policies, the imposition of high export taxes, and the remoteness from European markets. Under these unfavorable conditions the Islands could not compete with the West Indies, as Java, with the guiding hand of the Netherlands, was able to do.

## History of the Industry

The first record of an export of Philippine sugar was in 1795; that to the United States. By the middle of the next century the quantity exported was still less than 50,000 tons; but the maximum export of the Spanish Regime, 341,469 tons, was reached in 1894–95. This rapid increase can be attributed in part to the entry of British and American merchant-bankers into the island of Negros about 1860 and to their development of a sugar export trade through the port of Iloilo, Panay. (There is no good harbor on the west coast of Negros.) These exports moved chiefly to the United States, Great Britain, and China, while Spain, the mother country, received only a negligible amount.

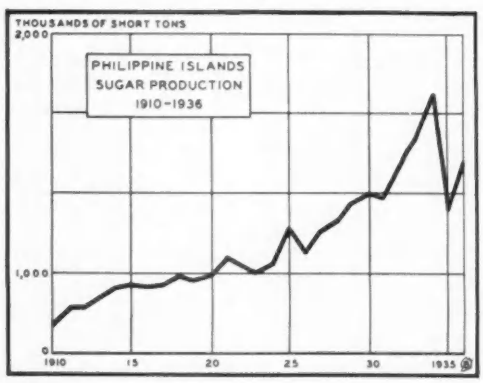


FIGURE 1.—During the twenty year period, 1914–1934, Philippine sugar production increased rapidly. However, with the advent of the Commonwealth it immediately dropped, probably through fear that it could not compete in the world market.

After the peak year of 1894–95 the industry declined rapidly, reaching a minimum in 1902. This decline was promoted by the failure of the Spanish administration to provide governmental facilities for scientific research and education in sugar production and by its failure to regulate plantation labor. The outbreak of the Philippine Insurrection in 1895, followed by the Spanish-American War, left the sugar industry in a highly disorganized condition at the beginning of the present century.

American administration has sought to develop the agricultural wealth of the Philippines, particularly along lines complementary to American agriculture, and to encourage native land ownership, enterprise, and investment. Governmental measures favoring this policy in regard to the sugar industry include the following:

(1) Free admission of Philippine sugar into the American markets. By the Payne-Aldrich Tariff of 1909 as much as 336,000 tons were admitted free annually, but from 1913 until 1934 there were no quantitative restrictions. Additional protective measures against Cuban sugar were also instigated from time to time.

(2) Public acquisition of lands formerly held by religious orders and Spanish proprietors, then the transfer of these lands to native or American citi-

zens, or in some cases corporations, but always in medium-sized holdings. This public land could be obtained by purchase or by a government homestead lease.

(3) Provision of credit facilities through the Agricultural Bank and later through the Philippine National Bank for the financing of the purchase of land, cane production, the construction of sugar centrals, and the export of raw sugar.

(4) Governmental support of scientific research, experimentation, technical education and extension work in cane production, disease control, farm management, and sugar manufacture.

Under these protective and guiding measures sugar production in the Philippine Islands increased rapidly. (See Figure 1.) Among the world's cane sugar producers, the Islands ranked eleventh in 1910, seventh in 1915, fifth in 1925, and third in 1934. Since 1925 sugar has been the leading export of the Islands. During this rapid rise in importance the industry has been largely dominated by Hawaiian and American capital and technical skill.

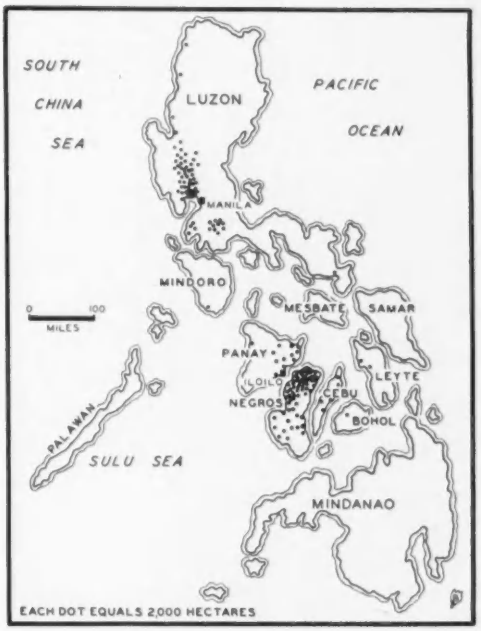


FIGURE 2.—There are two major areas of sugar cultivation in the Philippine Islands, namely; the Central Plain of Luzon and the island of Negros. The sugar soil of the province of Oriental Negros is said to be quite similar to that of Hawaii, which is sometimes referred to as the best sugar cane soil in the world.

## EXTENT OF PRODUCTION

Sugar cane will grow in every province in the Philippine Islands, but actually Negros and central Luzon have most of the sugar acreage. (See Figure 2.) Luzon has the greater acreage of the two, but, due to superior methods of cane growing and manufacturing, Negros produces almost 25 per cent more sugar than does Luzon (1932 figures).

In acreage among all crops sugar cane is in fifth place, utilizing about seven per cent of the cultivated land area, and following rice, corn, coconuts, and abaca respectively (Figure 3). More land could easily be used for sugar cane in the producing regions but since it is decidedly a plantation crop, the tendency is to use only those areas that lie in relatively large unbroken tracts and which, at the same time, are relatively accessible to the coast. In the two chief producing areas, rice is the only major crop which competes for the land to any appreciable extent, and in general it occupies the land that is not particularly suitable for sugar cultivation. In the northern valleys of Luzon tobacco is the principal crop, although sugar cane might easily be grown. Undoubtedly the frequency of typhoons in the north, as compared with the southern areas, has been a factor in limiting cane cultivation in Upper Luzon. The cultivated area of Mindanao and the southern islands is very limited, but offers attractive fields for the industry, especially in the Mindanao River Valley of Cotabato and the smaller valleys of Bukidnon.

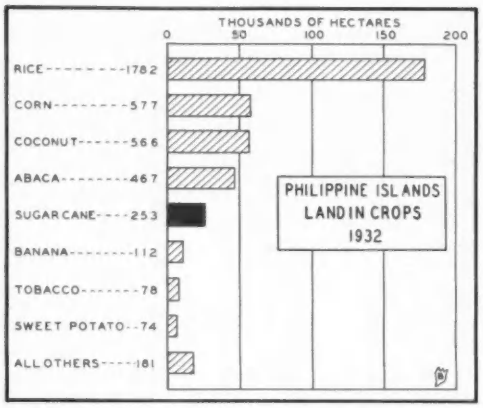


FIGURE 3.—The great acreage of rice, far in excess of that of any other crop, reflects the fact that the Philippines are still primarily a producer of food-stuffs for local consumption.

The average tonnage yield per acre in the Philippines has been considerably improved since 1920, especially on the plantations associated with the "centrals." Yet, despite this fact, it is still decidedly less than that of Java and Hawaii, somewhat less than the yield in Puerto Rico, and about the same as that of Cuba. However, it is greater than the yield in Louisiana. There has been an increase in acreage, but it is small compared to the increase in quantity of the output. During the decade from 1924 to 1934 the acreage increased slightly less than 30 per cent, whereas, the number of tons of sugar produced increased about 225 per cent during the same period.

The sugar production of the Islands is one of the more highly organized industries. It is largely plantation grown, and much of it by modern methods, which, in part, accounts for the increased production on a comparatively limited acreage. The establishment of sugar centrals, there are now about 45 in the Islands, has been a major factor in increasing the quantity and especially the quality of the product. It is the general custom to burn off the field after each harvest, thus keeping down the insect pests, and putting the field in readiness for the next cultivation. In parts of Negros, some of the plantations are replanted only when they cease to yield a profitable crop, but this is the exception and not the rule as planting usually takes place annually just after harvest. Some plantations are still planted and cared for by carabao and oxen, but the introduction of tractors and other modern machinery has been a big factor in the rapid increase of production. New varieties of sugar cane have been introduced from Java, Louisiana, and Hawaii, and the use of fertilizer is rapidly increasing. Railroads cut through the heart of the sugar territory of Luzon and Panay, but in Negros simpler transportation still prevails. The cane is cut and loaded by hand. Tramways, drawn by donkey engines or carabao, and bullock carts are used to transport the cane from the fields. The mills are run by steam, water power, or animal power depending upon the location and size of the mill.

In terms of value sugar cane outranks all other crops with the exception of rice, and even exceeded the latter during the years 1930–1934. During that period it accounted for about 40 per cent of the value of the nine major crops of the Islands.

### THE EXPORT OF SUGAR

Most of the Philippine sugar is exported, and relatively all of it is destined for the United States, about four-fifths of it being received at Atlantic ports via the Panama Canal. There are two sugar ports in the Archipelago: Manila, for the Luzon district, and Iloilo, for Negros and Panay. Sugar, although not a leading product in acreage or in the volume of exports, is in a class alone if considered from the standpoint of its value. This product accounts for almost 50 per cent of the total value of all

Philippine exports (Figure 4), and is truly the leading money crop of the Islands. For the year of maximum production, 1933, sugar constituted 61 per cent of the value of all exports, and provided 30 per cent of the national income and 60 per cent of the government revenue. Banks made 47 per cent of their loans on sugar and 15 per cent of the entire population was dependent on the industry.

The Philippines now occupy a major position among the cane sugar producing nations, ranking third for the five-year period ending in 1935 (Figure 5). However, India is not a major exporting nation so only Cuba exported more sugar than the Philippines during this period. About one-fourth of the product is handled by Filipino firms, the remainder divided between American, British, Spanish, and Chinese interests.

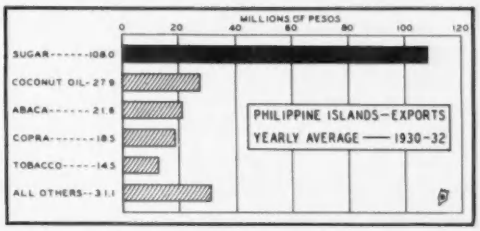


FIGURE 4.—Comparison of the value of the principal exports of the Philippine Islands.

## FUTURE OF THE INDUSTRY

The Philippine sugar industry faces a very acute situation. It has developed under the protective hand of the United States government until it constitutes over 50 per cent of all Philippine exports. Now, with independence under way, products from the islands are no longer to be admitted to this country free from import duties, although these are being imposed gradually, reaching the full amount at the end of ten years. It is reasonably certain that the production will decline rapidly from the high figure of 1934, for in no case can Philippine sugar stand the full duty in the United States. The Philippine Economic Association estimates that it will be undersold by Cuban sugar by the beginning of the seventh year of the Commonwealth. This undoubtedly presents a serious problem to the island planters. They are faced with a difficult adjustment, which probably means curtailment of production.

There are three possible lines of adjustment for the Philippine sugar interests to consider:

(1) Development of alternative markets for Philippine sugar;

(2) Development of alternative export commodities;

(3) Greater internal self-sufficiency.

Southeastern Asia and Australia are the natural geographic market areas of Philippine sugar, but these countries are well taken care of. Australia produces sufficient sugar for its own uses; British India has increased her production until she is practically self-supporting, and Java, who previously supplied this market, is really at an advantage over the Philippines if importation should be necessary. China is not a large importer and here again Java enjoys a competitive advantage. Japan, or rather Taiwan, has increased its production almost as rapidly as has the Philippines; so, at most, there can be but a limited market in that direction.

It is possible that other export commodities can be developed, for the Islands are certainly physically able to produce many tropical products. Coffee and tea have been grown, but disease has decreased their acreage as well as public interest in them. Silk and spices are possibilities, but probably will never be developed except in case of dire necessity. Silk may come to the front if the influx of Japanese into the islands becomes sufficient to warrant it. Cinchona or Peruvian Bark should offer op-

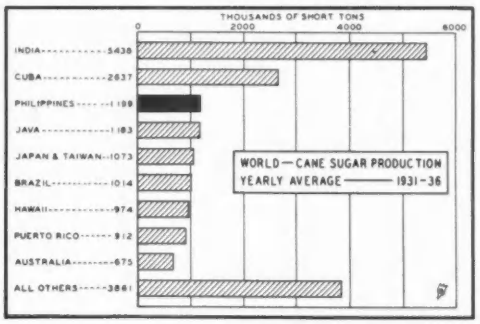


FIGURE 5.—The Philippine Islands have risen from a very mediocre position to third place among the world's cane sugar producers within a period of a few years. Today only two countries surpass them in production and only Cuba is a greater exporter of sugar.

portunities, although at present Java is enjoying virtually a monopoly of this commodity. Rubber is an industry that has been slowly increasing annually in the Philippines and, if given the proper encouragement, might easily be the successor to sugar. However, Philippine growers must fight an uphill battle if they are to capture a market in competition with the highly organized rubber plantations of the Dutch East Indies and the Malay States, this being almost impossible at the current market value of the product.

Greater agricultural diversification and increased production of the major food crops would in itself answer the question. The Islands should certainly grow sufficient rice to feed their population but they annually import a sizable quantity from Indo-China. The Filipino is becoming more and more a consumer of wheat, almost all of which is imported as flour; yet there is no reason why wheat cannot be grown in most of the higher valleys, and flour mills are one form of industrial development that might be profitable in the Archipelago. Cotton has been grown since time immemorial, yet never to any appreciable extent, usually being a secondary crop. However, all the dryer regions are potential cotton lands, and there is a nearby market, Japan, that is increasing its number of spindles annually. In fact, there should be more than the one existing cotton mill in the Philippine Islands. The development of the animal industries will probably continue to increase, although there are no important nearby markets. Likewise vegetables, fruits, and poultry are good possibilities, particularly if tobacco, cotton, sugar, abaca, and coconut products can be manufactured to a higher degree of perfection and exported as manufactured goods, thus creating a more industrial population.

The achievement of these readjustments will necessitate extensive education and demonstration throughout the Archipelago, and probably it will be necessary to subsidize certain industries for a time. It is possible that reciprocal trade agreements can be formed with certain nations and thereby foster some of these mentioned possibilities. However, the fact remains that although the sugar industry has been built up until it is the big money crop of the people, it is now due to trend in the other direction and will probably never again attain its present importance in the life of the native population.

# AGRICULTURAL PROBLEMS IN GRAINGER COUNTY, TENNESSEE

*Robert M. Glendinning and E. N. Torbert*

GRAINGER COUNTY presents conditions found in a large part of the Upper Tennessee Basin. It embraces physical features and types of rural land use characteristic of the area extending northeast-southwest, between the Cumberland Front and the Appalachian Mountains, from approximately the Virginia line to the vicinity of Chattanooga (Figure 1). Rural maladjustments are shared in common but to varying extent by counties within this area. In Grainger County, which is dependent upon a rural economy, the extent and severity of these maladjustments help make it one of the poorer counties of the area.

## Setting and Conditions

In bird's-eye view, Grainger County is seen to possess an east-west extent of some thirty miles and to be caught between the muddy waters of the Holston River on the south and the Clinch River on the north (Figure 4). The backbone of the county is Clinch Mountain. This pronounced ridge has the characteristic Appalachian trend and its steep, largely wooded slopes reach to elevations of more than 2,500 feet above sea-level and to more than 1,500 feet above some of the adjacent lower lands to the south and the north. From points on its summit, a clear day permits a survey of many square miles of territory, even to the easterly mountains and the westerly plateau edge. From the southern base of Clinch Mountain north to the waters of the Clinch River the land has the aspect of an irregularly corrugated surface. The sub-parallel ridges are abrupt, sharp, and chiefly wooded, while the valleys between are narrow, flattish to undulating strips of cleared land (Figure 2). An aerial view shows this section as parallel bands of dark (forested ridges) and light (cleared valleys). South of Clinch Mountain the lay of the land is appreciably different. Here the surface is strongly rolling and possesses no definite trends, rather, it is a slightly knobby surface with broad, irregularly shaped basins among the higher, rounded areas. There is much wooded land, marking, in patches of many shapes, the steeper slopes of the rolling terrain and breaking the pattern of the cleared land (Figure 3). The county is laced with many roads, but the vast majority are poor and at times impassable. Only two of them can be classed as major highways. These cross each other in the eastern portion of the county, one forming a link in the route that leads north toward Cumberland Gap, the other a segment of the highway leading from Knoxville to the Virginia border and beyond. One single-track rail line cuts across the northwestern corner of the county but otherwise rail facilities are lacking (Figure 4). Distribution of population, as indicated by the farmsteads, is in close accord with the surface conditions. In the section of closely packed ridges and valleys the population, relatively sparse, strings out along the valleys, while in the rolling country the population, more abundant in keeping with the greater extent of flatter land, is sprinkled over the area without conspicuous lines or nodes.

Grainger County, as viewed from

Clinch Mountain during the long summer season, appears as a land bountiful, a land of richly verdured ridges and hills, and productive valleys and basins. Closer inspection reveals the essential falsity of the first sweeping impression, for indices of agricultural difficulties appear on all sides. Erosion-scarred fields mark most farm holdings, cornfields on slopes as steep as the pitch of a gable portray maladjustments between surface configuration and land use, ramshackle dwellings on too-meager land parcels indicate a land seriously impoverished. To be sure, there are exceptions to such conditions, but they serve only to accentuate the widespread occurrence of the sore spots. Something is wrong in Grainger County and, judging from field examinations, in much of the larger area of which it is a sample. An unpublished financial evaluation of Grainger County by Arthur Pollard, one including certain natural resource items as well as the conventional monetary factors, shows that the county has an annual deficit of $212,000 (1932)—one-third of its total income (cited by J. P. Ferris, Tennessee Valley Authority, at a meeting of the American Society of Mechanical Engineers, Cincinnati, Ohio, June 20, 1935). There is, however, a brighter side. The problems and the problem areas are being located and analyzed, and general procedures for their regeneration are being pointed to, even though definite plans for the utilization of basic resources are not widespread in the territory of which Grainger County is a part. Such things take time and

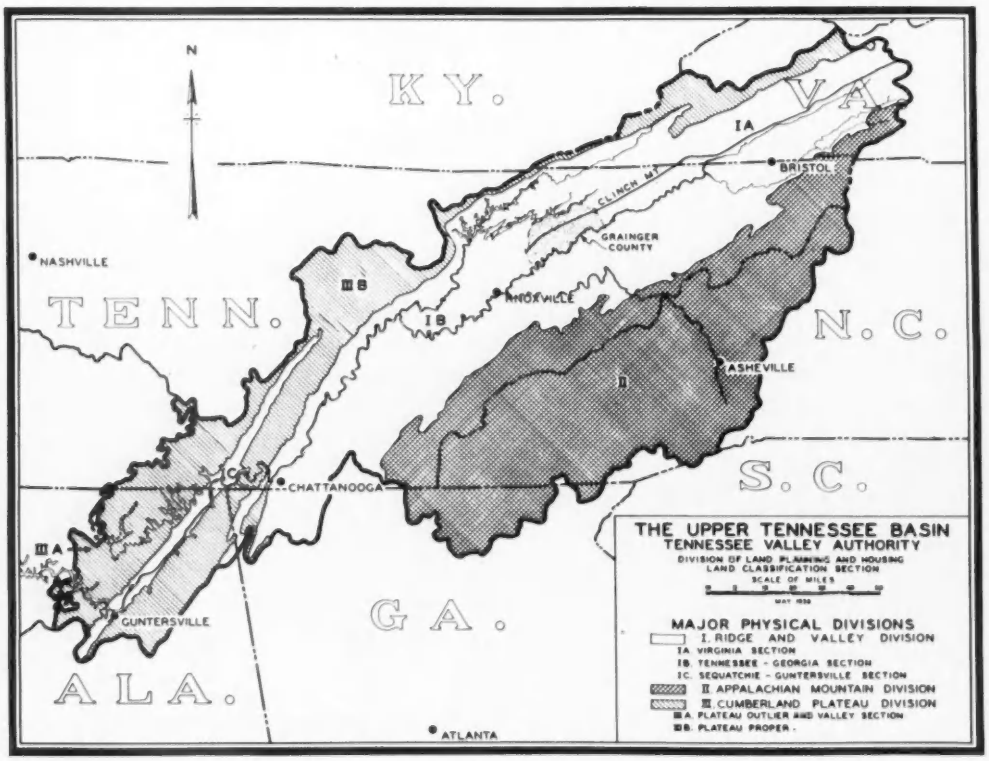


FIGURE 1.—Grainger County, appearing as the stippled area northeast of Knoxville, lies in the Ridge and Valley Province approximately midway between the Cumberland Plateau escarpment, to the northwest, and the Appalachian Mountain foothills to the southeast. Its position wholly within the upper Tennessee watershed is indicated by the heavy irregular line marking the drainage divides of the region.

careful weighing to prevent "rush ideas" from merely supplanting old problems with new ones.

Grainger County is predominantly agricultural, an area of croplands, pasturelands, and woodlands. There are no cities, factory centers, large commercial foci, nor mines. The great majority of the population is tied directly to the land, the remainder indirectly but none-the-less certainly. Under such conditions it is largely true that "as the land . . . so the people." The ability of the land to support becomes a very pertinent matter.

Preliminary investigations seemed to indicate that the reasons for the unsatisfactory condition of the county's agricultural economy are based primarily on extensive abnormal erosion, with accompanying wide-spread soil and water loss, and on a lack of adjustment between land use and the slope of the land. Therefore, these items were investigated by means of detailed and general mapping surveys. Maps of detailed Cross-Section Survey of Upper Tennessee, and Rural Land Classification Survey of the Tennessee Basin; and other data are in the files of the Land Classification Section, Land Planning and Housing Division, Tennessee Valley Authority. The matter of abnormal erosion proved to be relatively serious. Approximately 60 per cent of the land units of the county are seriously eroding, and in the area south of Clinch Mountain, which area is proportionately more widely used for direct agricultural purposes, nearly seventy per cent of the agricultural land units are undergoing abnormal soil loss. As was expected, the degree of abnormal erosion corresponds to the slope conditions. Agricultural

FIGURE 2.—A view of part of the typical ridge and valley portion of Grainger County, Tennessee, looking from the southeasterly slope of Clinch Mountain. The parallel ridges are abrupt and largely in woodland, the valleys gently undulating and marked by much cleared land. The "pioneer" farm in the right foreground is located on the thin stony sands which cover much of the southeastern slope of Clinch Mountain.

areas of 0 to 5 per cent grade are not suffering appreciable soil loss, but other such land units on steeper slopes are being severely damaged. Units with grades of 20 to 40 per cent, to take but one example, are marked by abnormal erosion to the extent of about three-quarters of their area. Fortunately, most of the serious erosion is sheet wash and finger gullying—types that, given time and money, can be fully controlled. As in the case of erosion, the lack of complete adjustment between agricultural land uses and steepness of slope proved to be significant. There are many areas where corn, for instance, is grown on slopes in excess of 40 per cent grade. However, the field investigations in map survey form showed that, with the exception of the little utilized slopes of Clinch Mountain, the cropped lands now on too-steep slopes could be accommodated on slopes of more suitable gradient.

In general then, time and money and careful planning and utilization can rectify the erosion and slope maladjustment conditions that are now contributing to the decay of the agricultural economy and decreasing the capacity of the land to support its farming population. But, granting that these problems are solved through the application of the known land management techniques, it is still reasonably doubtful that the rural economy of the county would be placed squarely and soundly on its feet. This is brought out by an investigation of the county's capacity to support a certain number of farms and farm families.

## FARM SUPPORTING CAPACITY

As here used, the term "farm supporting capacity" refers to the ability of the agricultural resources to provide an average livelihood for a certain number of families dependent entirely on the land.

There is, in this regard, a great need for the development of exact standards and criteria. There exists no complete agreement as to how many acres of land of given categories are needed adequately to support a farm family under the type of economy that is practised in Grainger County and adjacent areas. In view of this situation, it has been necessary to adopt a pragmatic yardstick, meanwhile granting that future methods of measurement may alter the conclusions—alter them in degree rather than in kind.

As measurements of the resources needed to provide a farm family in Grainger County with at least an average opportunity, two standards have been adopted. First, the farm unit should include 38.6 acres of cultivable land, and second, the total area of the farm should be at least 64 acres; thus allowing some 25 acres (about 40 per cent of the farm) chiefly for pasture and woodlot. The cultivable land criterion is the more important and, hence, is used as the primary measurement. East Tennessee representatives of the Rural Resettlement Administration estimate that about 40 acres of cultivable land are necessary per farm. Census data for Grainger County and seven other representative counties, Claiborne, Cooke, Hamblen, Jefferson, Knox, Sevier, and Union, were used to obtain the standards. In these eight closely grouped and essentially similar counties the average amount of cultivable land per farm is 38.6 acres and the average farm size is 64 acres. It is fully recognized that the average incomes which could be obtained from farms of the above size and character would not be particularly high. In the eight counties noted, the average gross income per farm is only about one-half that of the average gross income per farm in the United States. Even so, in many parts of Grainger County the pres-

ent status of farm families is *below* the average for the eight counties used as a yardstick.

Certain unavoidable assumptions have been made in the adoption of the standards. First, there appear to be no impending changes in the farm economy so radical that, on the whole, a family will be able to make an average living from farms appreciably smaller than the present average. In the eight counties noted, the size of the average family ranges between four and five persons. Second, it is assumed that a farm family with land that is average in amount and character possesses an average chance to maintain itself. And lastly, the average amount of cultivable land, the productive heart of the farm, is taken as the best obtainable index to the amount and the nature of the basic agricultural resources.

Before applying the above standards, it was necessary to ascertain the acreage of cultivable land as well as the total farmland acreage available. The former required the determination of all land *now* in crops, plus all land not now in crops but suited to crop production. Lands on slopes in excess of 30 per cent grade were ruled out as not being suited to crops—not cultivable in a reasonable sense. J. W. Moon, of the U. S. Bureau of Chemistry and Soils, in his report of January 1935, "Descriptive Soil Legend of Jefferson County, Tennessee," recognizes no soils as "crop soils" if they lie on slopes in excess of 30 per cent grade. The essential similarity of conditions in Grainger and Jefferson Counties allows the use of the same slope criterion.

The results indicate that Grainger County has approximately 69,000 acres

FIGURE 3.—A section of the rolling highland portion of Grainger County, Tennessee, looking northerly to the Clinch Mountain ridge, in the extreme background. Low knobs and knolls, wooded in their steeper portions, surround or border shallow basins which are utilized for crops or pasture. Contrast with Figure 2.

of cultivable land, which means 69,000 acres of land located on slopes of less than 30 per cent grade which are now in crops or are suited to crop production. The data and the methods used in this estimation are to be found in detail in the report cited in the note at the close of this article. They require too much space to be discussed here.

By dividing the cultivable land acreage by 38.6 and the total farmland acreage by 64 (omitting hamlets, villages, roads, etc.), the farm family supporting capacity of the county appears to be 1,661—each family to possess 38.6 acres of cultivable land and at least 25 acres of land suited to permanent pasture and woodlot. The results, expressed cartographically by rural land classification survey units, appear in Figure 4 (numerator item).

To give the figure for farm supporting capacity any real significance it is necessary to compare it with the present farm family "load" in the county. In that manner an estimate can be made which will indicate the extent of the agricultural resource problem.

## AGRICULTURAL OVER-POPULATION

The term "agricultural over-population" signifies that there are more farm families on the land than the land can adequately support under the existing types of farm economy. An approximation to the extent of agricultural over-population can be arrived at by comparing: (1) the number of farm

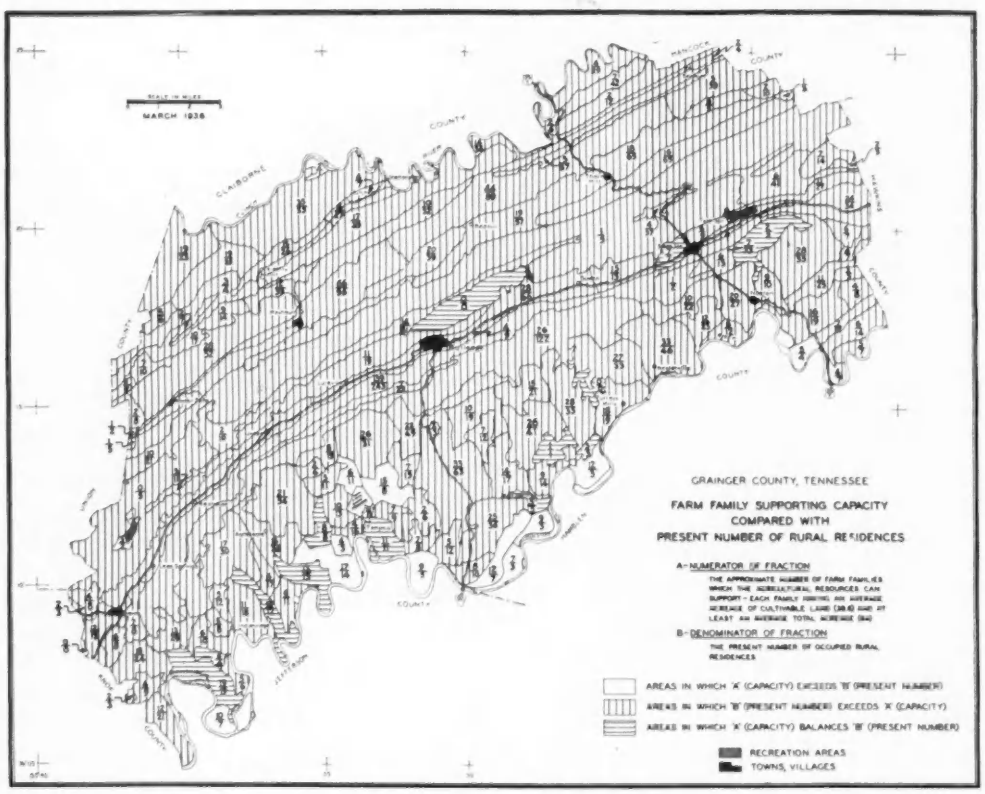
MARCH 1936
GRAINGER COUNTY, TENNESSEE
FARM FAMILY SUPPORTING CAPACITY
COMPARED WITH
PRESENT NUMBER OF RURAL RESIDENCES
A- NUMERATOR OF FRACTION
B- DENOMINATOR OF FRACTION
THE PRESENT NUMBER OF OCCUPIED RURAL RESIDENCES
AREAS IN WHICH 'A' (CAPACITY) EXCEEDS 'B' (PRESENT NUMBER)
AREAS IN WHICH 'B' (PRESENT NUMBER) EXCEEDS 'A' (CAPACITY)
AREAS IN WHICH 'A' (CAPACITY) BALANCES 'B' (PRESENT NUMBER)
RECREATION AREAS
TOWNS, VILLAGES

FIGURE 4.—It is the southern one-third of Grainger County which appears able, in terms of basic agricultural resources, to support the greater number of farm families *per unit area*. This is largely in accord with the degree of relief. The northern two-thirds of the county, an area of closely packed steep ridges and narrow valleys, possesses to much lesser degree, the ability to support farm families.

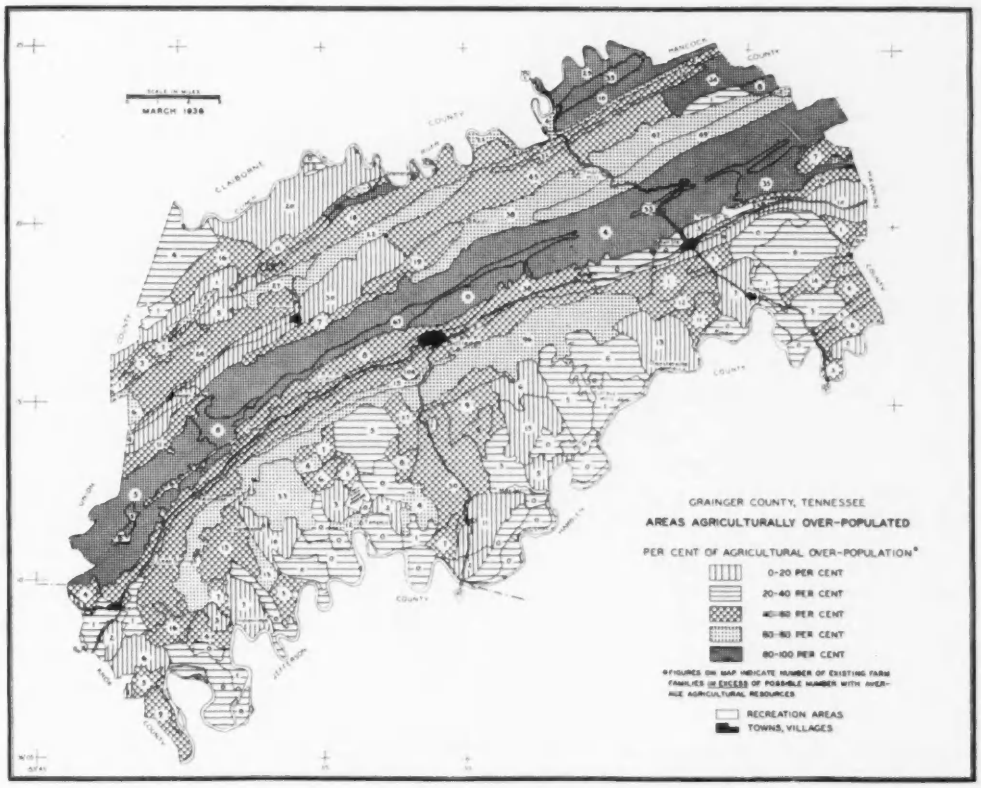
MARCH 1936
GRAINGER COUNTY, TENNESSEE
AREAS AGRICULTURALLY OVER-POPULATED
PER CENT OF AGRICULTURAL OVER-POPULATION*
0-20 PER CENT
20-40 PER CENT
40-60 PER CENT
60-80 PER CENT
80-100 PER CENT
*FIGURES ON MAP INDICATE NUMBER OF EXISTING FARM FAMILIES IN EXCESS OF POSSIBLE NUMBER WITH AVERAGE AGRICULTURAL RESOURCES
RECREATION AREAS
TOWNS, VILLAGES

FIGURE 5.—The problem of agricultural over-population is apparently more acute in the northerly two-thirds of Grainger County, especially so along the Clinch Mountain backbone and in the extreme northwest. In contrast, the less rugged country of the southern portion of the county possesses a greater agricultural resource which is reflected in a lesser problem of agricultural over-population in that section.

families that the resources can be expected to support, as discussed above, and (*2*) the number of farm families now on the land—the present load. When the second number exceeds the first, agricultural over-population may be said to exist, and the amount of excess shows the degree of seriousness of the problem. The present number on the land has been ascertained as 2,934. This figure was arrived at through study of recent planimetric maps and partly from an also recent land use survey. A comparison of the two figures (1,661, apparent supporting capacity, and 2,934, present load) points to an excess of farm families to the amount of 1,273. Figure 5 shows the distribution of these farm families according to land use survey units.

The number of excess farms, as representing the degree of over-population, is probably too high. It does not take into account the income items received from pensions, insurance, money from relatives living elsewhere, etc. However, the mathematically exact number is not of utmost significance; rather, it is the approximate number, taken as indicative of the general degree of agricultural over-population, that is important. Granting that the number should be somewhat reduced, the situation still appears to be serious. Even if the number were reduced to 1,000, a reduction probably more than sufficient to cover

the relatively intangible items, the results show that the county is agriculturally over-populated to the extent of more than one-third.

Unless there is a great change in the present economy, an occurrence in no way indicated at present, the county must face a situation wherein at least a third of its farm families do not possess even an average chance to support themselves, let alone have the capital and the incentive to preserve and regenerate their land resources.

There appears to be a cycle, certainly a vicious one, operating in the area. Improper land management, resulting especially in losses of basic soil and water resources, decreases the farm supporting capacity. The decrease in supporting capacity means less opportunity for resource conservation and encourages (forces) improper land management.

## CONCLUSION

The present study indicates that, whatever, and however numerous, other problems may be, the really fundamental problem in Grainger County is that of too many farm families in relation to the ability of the land to support them. If this be true, then the basic "problem area" map of this predominantly agricultural area is one showing the distribution, by relatively small land units, of the amount and degree of agricultural over-population (Figure 5).

This belief, based on this study as well as intensive field examinations, is strengthened by other data. During April and May 1935, for example, there were approximately 600 families on relief in Grainger County. Judging from a very detailed study of relief families in the adjacent and patently similar area of Jefferson County, it is probable that of the 600 families on relief in Grainger County at least 500 were farm families. Attention needs to be called to the fact that the relief figures represent extreme want, destitution, whereas the figure for agricultural over-population, given above, represents poverty and sub-standard conditions, including extreme want. In Jefferson County, the average size of a farm operated by a relief family was 22 acres, of which only 11 acres were in crops. In marked contrast, the average size of all farms was more than three times as great and the average cropland acreage was more than double. Evidently, in areas of this character, there is a pronounced correspondence between small farms, small crop acreages, and inability to operate successfully. Larger farms, with more cultivated and cultivable land per family are needed—but only a certain number of such farms can be provided by the basic land resources. An increase beyond that number, apparently what has happened in Grainger County, results in an agricultural machinery that wears and breaks under its load. The multifold consequences appear conspicuously in the rural landscape.

NOTE: This article is drawn from a report by the present authors, "A Land Classification Approach to Land Use Problems: Illustrated in Portions of the Upper Tennessee Basin." On file in the Land Planning and Housing Division, Tennessee Valley Authority, Knoxville, Tenn. 1936.

# PRINCE RUPERT, BRITISH COLUMBIA

*John Q. Adams*

PRINCE RUPERT is a frontier port on the north Pacific coast. Located at the western end of the Canadian pioneer fringe and hemmed in on the north by the Alaskan Panhandle and the unproductive highlands of northern British Columbia, it is the potential outlet for the northwestern margin of the advancing American agricultural frontier (Figure 1).

Prince Rupert is young, younger than the Alaskan ports that were founded during the gold rush at the turn of the century. Yet, in the short time since the city was incorporated (1910), its dominant functions and cultural landscape forms have undergone marked changes.

Prince Rupert was designed and built to function as a potential world port, the Pacific terminus of the new National Transcontinental-Grand Trunk Pacific Railway. Soon (1920) the railway became bankrupt and was taken over by the Canadian National Government and operated on a smaller scale. The young city, thus deprived of its chief financial support, and further handicapped by slow development of its hinterland, never became an important commercial center. Prince Rupert has continued to function chiefly as a fish shipping port and center of local trade and government. At present an attempt is being made to secure bonds for the construction of a wood pulp mill within the city. The establishment of this new industry would change again the economic life of the community.

Changes in the function of Prince Rupert have caused changes in the cultural landscape. Areas planned for one use have been diverted to another or remain unoccupied. Erection of the pulp mill would cause further readjustment.

The purposes of this study are to state, and, so far as possible to explain, the origin, location, metamorphosis, and probable further development of Prince Rupert. Emphasis will be placed upon dominant activities, or functions, and their objective expressions in the morphology of the cultural landscape.

## Location and Origin of the City

Prince Rupert is on Kaien Island, at the mouth of the Skeena River, near the northern end of the coast of British Columbia (Figure 1). This location was chosen in 1905 by the builders of the Grand Trunk Pacific Railway because at that time both situation and site appeared to have marked advantages.

The situation of Prince Rupert seemed particularly favorable. It gave easy access to the open sea. Also, much trade with the Orient was expected to flow through the new port because it would be the meeting place of a short trans-Pacific route and a low, easy trans-mountain route (Tables I and II). Many pioneer settlers already were established along this trans-mountain route and in the projected hinterland in the northern prairies. Apparently within a few years these tributary areas would support large and prosperous population groups. In addition Prince Rupert was situated near the mid-point of the drowned coast of British Columbia-Southern Alaska. This coastal zone was known to be rich in fish, forests, and minerals. These resources were exploited from small ports which were not connected with the continental railway net. As a result, Prince Rupert with its

TABLE I

COMPARATIVE SAILING DISTANCES, NORTH PACIFIC ROUTE *

| *From* | *To* | *Distance* (Nautical miles) |
|---|---|---|
| Prince Rupert | Yokohama | 3,843 |
| Vancouver | " | 4,363 |
| Seattle | " | 4,259 |
| San Francisco | " | 4,525 |

* Sources: Prince Rupert and Vancouver, Map of British Columbia (scale 1/1,000,000), Dept. Lands, Victoria, 1933; Seattle, Putnam's *Economic Atlas*, Ed. I, pl. 22; San Francisco, *Times Atlas*, Ed. I, pl. 92.

central location and potential transcontinental rail connections seemingly would be ideally situated and equipped to become the entrepôt for the whole coast. These possible advantages of Prince Rupert's situation seemed obvious in 1905. However, such advantages were apparent rather than real; their actual cumulative effects could not be judged until the city and railway were built and the hinterland settled.

Advantages of Prince Rupert's site, on the contrary, were known before the city was founded. The large, deep, ice-free harbor was not blocked by storm, but was occasionally obscured by fog. A wide sill of low but rugged land suitable for a townsite extended along the harbor and almost around Kaien Island (Figure 2). Low rain-soaked mountains back of the harbor contained an abundant supply of pure water that could be used for domestic purposes and for power.

After an extensive search investigators for the railway found no other place

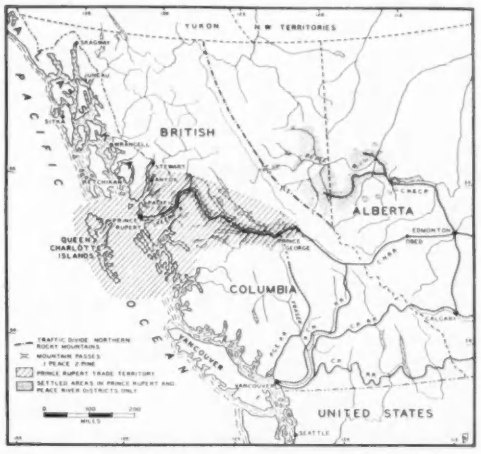


FIGURE 1.—Reference map for British Columbia and adjacent territories. On the map: for C.N.R.R. read "Canadian National Railways," for C.P.R.R. read "Canadian Pacific Railways," and for P.G.E.R.R. read "Pacific Great Eastern Railway."

TABLE II

SUMMIT ALTITUDES AND MAXIMUM GRADIENTS OF SELECTED TRANS-MOUNTAIN RAILWAYS OF WESTERN NORTH AMERICA *

| *Name of Railway* | *Summit Altitudes* | *Maximum Gradient Per Mile* West-bound | East-bound |
|---|---|---|---|
| Grand Trunk Pacific (Winnipeg to Prince Rupert) | 1 summit 3,720 feet † | 26 feet | 52.8 feet |
| Canadian Northern (Winnipeg to Vancouver) | 1 summit 3,720 feet † | 26 feet | 37 feet |
| Canadian Pacific (Winnipeg to Vancouver) | 2 summits 5,321 feet 4,351 feet | 116 feet | 118 feet |
| Great Northern (Minneapolis to Seattle) | 3 summits 5,204 feet 3,050 feet 3,375 feet | 116 feet | 116 feet |
| Northern Pacific (Minneapolis to Seattle) | 3 summits 5,572 feet 4,200 feet 2,832 feet | 116 feet | 116 feet |
| Union Pacific (Omaha to San Francisco) | 3 summits 8,000 feet 6,900 feet 7,000 feet | 105 feet | 116 feet |
| Western Pacific (Salt Lake City to San Francisco) | 2 summits 5,712 feet 5,018 feet | 53 feet | 53 feet |
| Chicago, Milwaukee, and Puget Sound (St. Paul to Seattle) | 2 summits 6,352 feet 3,010 feet | 89 feet | 105 feet |

* Sources: A. E. Parkins, *Journal of Geography*, Vol. VIII, No. 5 (Jan. 1910), pp. 101–109; F. A. Talbot, "The Making of a Great Canadian Railway," London, 1910, p. 199; N. J. Thomson, C.N.R.R., Montreal.

† Both railways use the same pass, the "Yellowhead."

with such a favorable combination of site and situation. Hence, the Kaien Island location was selected and the first party of engineers landed on the island in the spring of 1906.

## THE PLANNED CITY OF 1915

The general structure and the component functional areas of Prince Rupert were plotted in accordance with a carefully made plan. Objectives of the city planners were: to provide facilities for a first unit or nuclear port-city of thirty thousand people; to locate this first unit so that other areas of usable land would be accessible in case of future expansion of the city; and to adapt the urban structure and functional zones to the topography and drainage of the site.

In keeping with these objectives a first unit of 11,462 lots with proportionate blocks of industrial and public lands was plotted on the Kaien Island side of the harbor. This site, a sill of low rolling land, is almost midway between two similar, but larger lowlands, one on the opposite, or southeast, side of Kaien Island, the other on Digby Island across the harbor (Figure 2). These two areas were purchased and reserved as easily accessible sites for future additions to the city.

Urban structure was nicely adjusted to land and water forms. The structural axis was made parallel to the harbor. This was done in order to place the longer northeast-southwest streets in line with the numerous small ridges of the site and also to give each part of the city direct access to the waterfront by means of short cross streets (Figures 3 and 4). Even closer adjustment to land forms was shown in laying off streets on the steeper slopes, especially at the ends of ridges and on rounded hills. In such places streets were planned to follow contour lines, thus creating a more irregular and more beautiful pattern.

FIGURE 2.—Prince Rupert occupies the sill of low ground on the near side of Kaien Island. The orientation of the city's structural axis parallel to the harbor is apparent as is the open pattern of settlement outside the central urban zone. The large area of lowland on the far side of Kaien Island is hidden by Mount Oldfield which occupies the center of the island. (Courtesy of W. W. Wrathall.)

Distribution of the major functional areas of the planned city was in keeping with the outstanding topographic divisions of the site. These topographic divisions are created by the valleys of two small streams, Hays Creek and Morse Creek, which cut across the northeast-southwest ridges and divide the townsite into three areas of upland separated by two narrow belts of lowland (Figure 3). The more rugged but better drained uplands were platted for residence, business, and public use; the two lowlands were reserved for recreational and commercial use. A third belt

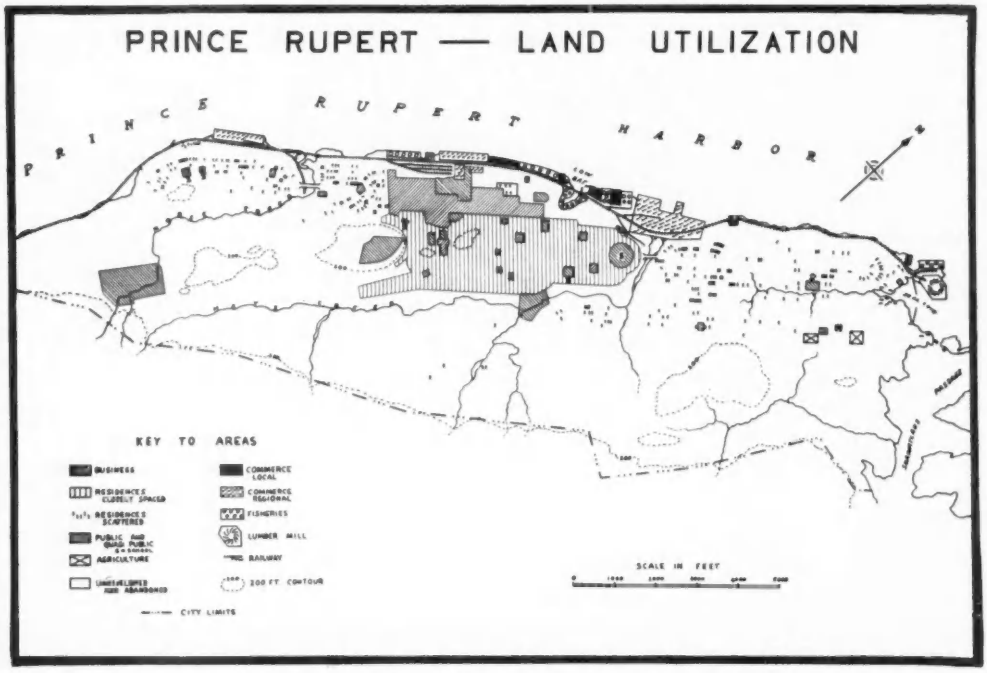


FIGURE 3.—Three outstanding facts shown are: incomplete occupance of the site, orientation of the structure with the harbor, and concentration of forms in the central area.

was to be created along the waterfront by blasting away the low cliffs. This zone was set aside for port works, warehouses, factories, and railway yards (Figure 4).

The city plan was completed and the site plotted in 1909. Lot sales were held in 1909, 1910, and 1912, and soon many buildings were erected. With the arrival of the first through-train from Winnipeg on April 9, 1914, and the first through transcontinental train from Quebec on June 1, 1915, the period of planning came to a close. Prince Rupert was only partially developed, but the railway was completed, port works were built or building, and the people looked forward with confidence to the attainment of the goals set by officials of the railway ten years before.

## THE CITY TODAY: FUNCTIONS

Prince Rupert is but little larger than it was in the construction period, 1910–1915 (Table III). Not only has it failed to grow as expected but its dominant functions are not those for which the city was planned and built. Today Prince Rupert is chiefly an important landing port for the north Pacific halibut fishery, and a trade and government center serving northern British Columbia. Lesser functions are: a few minor port activities, and certain services connected with the railway terminal. All these functions depend directly or indirectly upon Prince Rupert's northern location on the Canadian Pacific Coast, and the presence of the railway.

TABLE III

POPULATION OF PRINCE RUPERT *

| *Date* | *Population* |
|---|---|
| 1911 | 5,000 |
| 1921 | 6,393 |
| 1931 | 6,350 |

* Sources: For 1911, F. A. Talbot, "The Making of a Great Canadian Railway, London, 1912," p. 321 (an estimate made after visiting the city). Data for 1921 and 1931, Seventh Census of Canada, Vol. II, Ottawa, 1934, p. 106.

For many years Prince Rupert was the chief halibut receiving port of the world and now is second only to Seattle

TABLE IV

FREIGHT SHIPPED FROM PRINCE RUPERT TO THE INTERIOR *

| *Commodities Shipped* | *Chiefly to Northern British Columbia* | | *Commodities Shipped* | *Chiefly to Eastern North America (via Edmonton)* | |
|---|---|---|---|---|---|
| | *1934* (Tons) | *1935* (Tons) | | *1934* (Tons) | *1935* (Tons) |
| Oil and gas | 2,164 | 1,451 | Fish and fish products | 8,047 | 10,805 |
| Groceries | 312 | 229 | Fish oil | 544† | 70 |
| Machinery | 107 | 55 | Fish meal | 92 | 62 |

* Source: N. J. Thomson, Commissioner of Industries, C.N.R.R., Montreal, Feb. 11, 1936.
† 370 tons from Alaskan ports.

in this respect. Prince Rupert's advantages of northern location and transcontinental rail connections are peculiarly effective here because most of the Pacific halibut catch is taken on fishing grounds lying north of the city. The fresh fish are then packed in ice and moved as rapidly as possible through Prince Rupert and other railhead ports to the great fresh fish-consuming markets in eastern United States and Canada. Even the 25 per cent of the catch that is frozen and marketed during the midwinter closed season is held in storage at the railhead ports so that the fish may be forwarded quickly when demand arises (Figure 5). Consequently, Prince Rupert, the northernmost of these ports, is the leading market for halibut taken on the northern British Columbia banks, and is also an important market for halibut taken on the Alaska banks. These fishing grounds are the productive parts of the city's tributary sea zone and are far more important to Prince Rupert than is its hinterland.

In contrast with this extensive and productive sea zone, the hinterland of Prince Rupert is small and poorly developed. The city's trade is restricted largely to the interior valleys lying west of Prince George and to the coast and

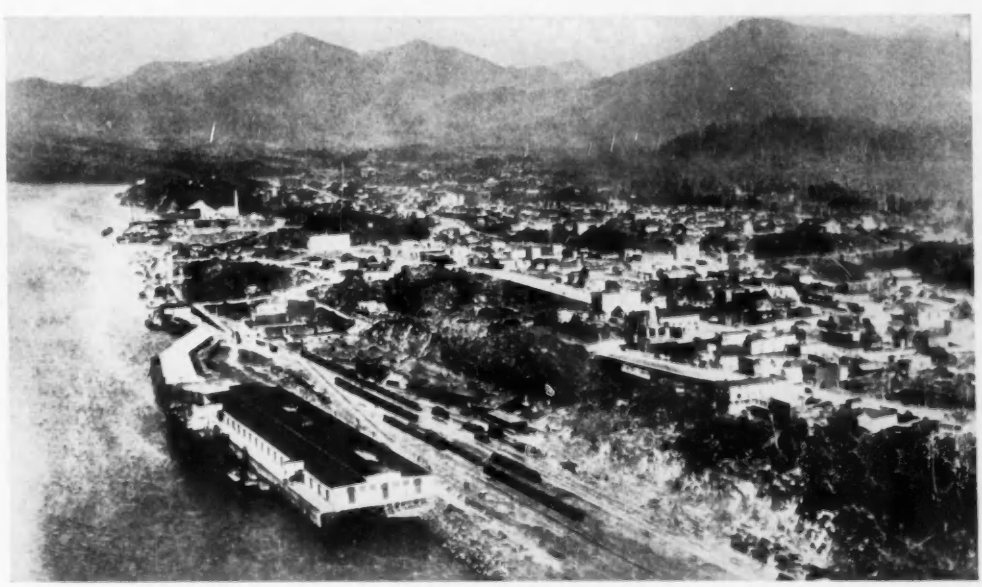

FIGURE 4.—Central and eastern parts of Prince Rupert. Orientation of water front forms and street pattern parallel to harbor is shown. In the foreground the large ocean dock and the railway yard are prominent features. The business district is on the higher land to the right. In the center and right background is the main residence section separated from the business district by a low ridge. In the distant background are scattered residences, right, and fish docks and shipyard, left. (Courtesy of Royal Canadian Air Force.)

TABLE V

FREIGHT SHIPPED FROM THE INTERIOR TO PRINCE RUPERT *
For crop year ending July 31.

| Commodities Shipped | Chiefly from Northern British Columbia | | Commodities Shipped | Chiefly from Northern Prairies (via Edmonton) | |
|---|---|---|---|---|---|
| | 1934 (Tons) | 1935 (Tons) | | 1934 (Tons) | 1935 (Tons) |
| Coal | 4,752 | 5,405 | Wheat | 33,770 | 71,118 |
| Matchwood logs | ..... | 5,291 † | Flour and feed | 1,253 | 1,005 |
| Ice | 1,009 | 733 | Meats | 1,045 | 978 |
| Lumber | 608 | 649 | Groceries | 150 | 189 |
| Livestock | 243 | 346 | Machinery | ..... | 123 |
| Hay | 346 | 302 | | | |
| Vegetables | 147 | 126 | | | |
| Fruit | 103 | 57 | | | |

* Sources: Same as Table IV except data on wheat and matchwood logs from W. H. Tobey, C.N.R.R., Prince Rupert.
† Converted from board feet Brereton scale.

islands north of Vancouver Island (Figure 1). This entire territory including Prince Rupert had a population of only thirty-one thousand (31,634) in 1931. The undeveloped state of the inland part of this hinterland is shown by the sparse population (15,505 people in 1931) and the small amount of goods moved between the territory and Prince Rupert (Tables IV and V). The nearby coast and islands in Prince Rupert's trade territory have even less population, 9,779 people in 1931. Commercially they depend upon Prince Rupert only for small broken lot shipments of food, clothing, hardware, and other necessities. Larger coast settlements, such as the mining towns of Stewart and Anyox, obtain most of their supplies from Vancouver by boat.

FIGURE 5.—Halibut boats at the main fish dock in Prince Rupert.

The area which depends upon Prince Rupert for governmental and quasi-public services is far larger than the city's trade region. Sparse population has made necessary large political and social units in northern British Columbia, and the railway and connecting waterways have focused these areas on Prince Rupert. The public and quasi-public agencies which have their regional headquarters at Prince Rupert are: branches of almost every division of the British Columbia Provincial Government, all divisions of the Skeena County B. C. Government, trans-mountain division of the old Grand Trunk Pacific (now the Canadian National) Railway, and quasi-public organizations such as the Anglican Church and the Associated Chambers of Commerce of Northern British Columbia. These governmental and social activities are second only to the fishing industry in the economic life of Prince Rupert.

Port activities which were expected to dominate the city's economic life are

of minor importance. These port functions are: to import a few commodities for trans-mountain areas, to export small quantities of wheat and forest products, to care for several thousand transient summer tourists, and to repair ships and fishing boats.

Imports for trans-mountain regions are halibut, fresh and frozen, and small quantities of petroleum. Movement of these products depends upon fishing and wholesale trade activities already discussed. No Oriental goods or Alaskan land products move inland through the port.

Exports through Prince Rupert also are small in volume. A moderate quantity of wheat from northern Alberta is shipped through the port each year. This movement did not start until 1926, when the Dominion Government opened a 1,250,000-bushel elevator on the water front. Since that time the volume of grain exports has been so small that during most years the building (Figure 6) has been used as a storage rather than a transit elevator (Table VI). The only other exports of any great importance in recent years are cottonwood and aspen logs shipped from the interior valleys. A few shiploads of these logs moved out to the Orient in the years 1934 and 1935.

TABLE VI

GRAIN RECEIVED AT THE ELEVATOR, PRINCE RUPERT, BRITISH COLUMBIA

Crop Years 1926–27 to 1933–34 *

(Crop year ends July 31)

| *Receipts* | *Wheat* (Bushels) | *Oats* (Bushels) | *Total* (Bushels) |
|---|---|---|---|
| 1926–27 | ..... | ..... | 5,634,074 |
| 1927–28 | ..... | ..... | 8,005,918 † |
| 1928–29 | 2,499,393 | 1,653 | 2,501,046 |
| 1929–30 | 1,118,440 | 395 | 1,118,835 |
| 1930–31 | 373,638 | ..... | 373,638 |
| 1931–32 | 1,150,992 | 104 | 1,151,096 |
| 1932–33 | 139,278 | ..... | 139,278 |
| 1933–34 | 1,089,374 | 2,530 | 1,091,904 |
| 1934–35 | ..... | ..... | 2,294,149 † |

* Sources: 1926–27 and 1927–28, S. W. Fairweather, Director Canadian National Railway Bureau of Economics; for 1928–29 to 1933–34, Report on the Grain Trade of Canada 1934, Dominion Bureau of Statistics, Ottawa, 1935, p. 81; for 1934–35, W. H. Tobey, Prince Rupert.

† All grains combined; mostly wheat.

Each summer large numbers of tourists visit the city because Prince Rupert is a port of call for all Canadian boats on the famous inside passage tour to Alaska. Most of the visitors stay only a few hours. A few tourists leave the boats and go inland over the railway, and a similar number reverse this itinerary. Profits from the tourist business accrue largely to taxicab drivers and the retail stores which sell souvenirs and other goods of interest to tourists. This trade fluctuates with the business cycle and has only recently (1936–37) approached the 1925–30 level.

The large dry dock and ship repair yard located at the mouth of Hays Creek was built by the railway during the war (1914–1917) and was taken over by the Dominion Government in 1920. Both yard and dock were intended to serve naval as well as civilian needs. In the brief post-war boom two ocean vessels of moderate size were constructed at the yard, but such construction was not resumed in the 1925–1930 period of business expansion. At present, the only large boats repaired at the yard are the Canadian National Government's Coasting vessels, and these provide only a few weeks' work per year for several hundred men. Repair work on small fishing boats and similar craft is a more regular but still smaller source of income. Consequently, the yard is operated at a loss, and its antiquated machinery makes it so expensive to maintain that the government apparently is willing to cease operating the enterprise. In line with this policy, the Dominion Government in September 1935 granted an option on the yard to a corporation that announced its intention to build a pulp mill on part of the site. The pulp mill company agreed to continue operating the shipyard for a period of twenty-five years. As late as March 1937 the pulp mill project was still in the "promotion

FIGURE 6.—Grain elevator located near the southwest end of the water front. Typical second growth conifers on idle land in foreground.

stage" of development. The willingness of the government to permit the unused land on the site to be diverted from a port activity to a manufacturing activity emphasizes further that Prince Rupert is not the great port city that was planned in 1905–1915.

Railway division operations constitute the last and smallest group of functions which support Prince Rupert. However, in light of the reduced economic status of Prince Rupert the railway activities are important sources of employment because they provide work for two hundred family men at all times and an additional hundred single men in better times. These railway-governmental functions are divided among operating, engineering, maintenance of way, repair shop, shipyard, express, telegraph, passenger, and freight departments. The operating maintenance and engineering departments are in charge of the line all the way to the continental divide at Red Pass Junction near the British Columbia-Alberta boundary. The other departments are concerned either with maintaining and serving the local terminals or the first division out of Prince Rupert which extends to Pacific 119.3 miles east (Figure 1).

Prince Rupert today has fewer people and has other functions than the great port metropolis predicted in 1905. As a result, the cultural landscape forms created by these activities are scattered within an urban structure that is too large for present functions and is better suited to other industries. The varying degrees of success attained in fitting the different groups of forms created by present dominant functions into a structure not planned for such a combination of activities is an interesting aspect of the geography of Prince Rupert.

## THE CITY TODAY: STRUCTURE AND FORMS

Today (1936–37) the urban structure of Prince Rupert is essentially that of the planned city of 1915. However, a few changes have developed largely due to the failure of the city to grow and to attract great commercial and manufacturing industries. Street lines and the distribution of existing functional areas follow the original plan, but only 40 per cent of the incorporated area is in active use-occupance, and less than one-half of this used area is closely occupied (Figure 3). A brief description and explanation of the various functional areas and their component forms completes the picture of Prince Rupert as it is today.

The lowland areas that were reserved for recreational, commercial, and industrial use are least developed. Hays Creek valley contains only a small park, opened in 1932, and Morse Creek valley is unoccupied except for a short railway switch track and a graveyard.

The man-made sill of lowland along the harbor is partially occupied. Railway tracks extend the full length of the water front, but only the central section, between the mouths of the two creeks, is used extensively. Here most of the narrow sill made by blasting away the cliffs is occupied by such forms as docks for fishing boats, fishermen's supply stores, and general merchandise warehouses. Two other prominent forms

are the railway yard and a large "ocean dock" for general regional commerce. The shipyard occupies a large block of level land at the eastern end of this developed section. This site was made by filling in the shallow mouth of Hays Creek and diverting the stream through a tunnel under the fill. Complete development of this middle section of the water front is a result of its central location and early start. The first party of engineers sent by the Development Company located their base camp at a small cove now covered by the ocean dock. Prince Rupert has grown from this nucleus.

Outlying areas of developed water front are the wheat elevator west of Morse Creek (Figure 6) and the great fish storage plant located on a small cove near the eastern end of the town.

In spite of the fact that most of the water front is still unoccupied the area is overbuilt for certain functions. Elevator, dockyard, and large ocean warehouses are used far below capacity; and a sawmill recently has been dismantled and removed. In contrast, the large amount of valuable water front space devoted to the fishing industry is intensively utilized. The only recent addition to the group of water front forms is a new fish storage plant erected near the ocean dock in 1934.

Typical water front forms are oblong in shape and have the long axis parallel to the harbor. This shape and orientation is chiefly a result of the great expense of blasting out sites on the land side and the almost equally great cost of building foundations out into the deep harbor. A third factor which has made it possible to construct buildings with this alongshore orientation is the relatively low price of the undeveloped water front land.

Upland areas which were reserved for residence, business, and public forms,

FIGURE 7.—Forms typical of the business district occupy the foreground and better type residence forms are on the ridge in the background. The large, square, gray building near the right end of the ridge is a convent.

are occupied only in part. The one closely occupied upland area is on the low ridge that lies between the lower course of Hays Creek and the bluffs that rise above the central section of the water front. Early and comparatively complete occupance of this ridge is a result chiefly of its location adjacent to the central water front section where the city was founded. Present limits of this business-residence zone are those reached at the time of the great deflation of 1914–1916.

Within these limits the business and residence sections form two belts parallel to the harbor. Business forms occupy the northwestern or harbor face of the ridge where there is easy access to the railway yards, warehouses, and docks along the water front. The present center of this business section lies several blocks east and a block south of the area planned as the center because land speculators drove the prices of lots near this point higher than the merchants (the actual and final buyers) were willing to pay. Subsequent growth of the city has not been sufficient to cause this empty area to be filled, although the lot prices came down to a reasonable figure after 1915 when the city stopped growing.

Residence forms occupy the summit of the central ridge above the business

district and extend down the back, or southeastern, slope as far as Hays Creek. Higher class residences occupy the top of the ridge, where the view is better, and middle and lower class homes are on the less desirable sites on the back slope (Figures 7, 8 and 9). Most of the middle and lower class homes are occupied by fishermen. These men are forced to live here far from the fish docks, because Prince Rupert was not planned for fishermen and fishing but for urban workers

FIGURE 8.—A middle class residence on the back slope of the central ridge. The house is built high above the ground in order to provide a basement without the expense of blasting one from the solid rock.

and industry. Consequently, in the original plan the less desirable back slope of the central ridge was plotted in small cheap lots for the expected factory and commercial workers. These low cost sites are the only ones the fishermen can afford. Although there are unoccupied blocks of land on or near the water front that the fishermen might occupy, the better situated of these areas are owned by the Dominion Government and are reserved for other uses.

Three areas of "scattered residences" are distributed respectively (1) westward along the central ridge to the valley of Morse Creek, (2) on the small ridge west of that Creek and (3) along two low ridges which extend eastward from Hays Creek. The first and last of these areas have cheaper houses occupied chiefly by fishermen and others of moderate income. The second area, i.e., the small ridge west of Morse Creek, has many better class homes especially on the slope facing the harbor.

Most of the large area of undeveloped land between the residence sections and the inland city limit was originally plotted for residence use, but was never opened for sale. Title to most of this land, comprising almost half the townsite, is held either by the city or by the old Development Company now controlled by the Dominion Government. This area was cleared about 1910, and now presents a desolate appearance with the young conifers growing vigorously among the large whitened stumps of the old forest (Figure 10).

Public and quasi-public (church-lodge) lands are scattered throughout the occupied areas. The more important of these are: the public school lands, the public park, and the graveyard located respectively in the valleys of Hays Creek and Morse Creek, a smaller "tourist park" on the site of a projected "million dollar tourist hotel" on the high ground south of the railway yards, and a group composed of two athletic fields, a small "exposition building," and the city reservoir on the otherwise useless steep slopes of a hill which rises from the west end of the central ridge.

Far out along the last developed street near the southeast border of the settled area are four so-called farms. Two are dairy establishments that depend entirely upon imported feedstuffs. The other two are market gardens operated by Orientals (Figure 11). These truck farms can exist only as a result of the low labor cost and an abundance of cheap fertilizer in the form of manure. One truck farm obtains manure free from the largest dairy, and the other truck farm uses pig manure produced on the establishment as a by-product of feeding pigs on garbage gathered throughout the

city. Thus the thin muskeg and rocky till on the site of Prince Rupert is made to yield a small return when built up with imported fertility. All the farms are small; the largest is approximately four acres. Cheap land on an open street is the chief locational factor for these farms. A minor advantage of their location as a group is the reduction of the nuisance problem of barnyard odors due to their position on the southeastern or leeward edge of the settled area.

Prince Rupert not only has failed to grow as expected, but in its present stage of arrested development it has assumed a peculiar and unique structure. A nuclear and fairly well settled city, almost complete in itself, has developed in the area between the lower part of Hays Creek and the harbor. Outside this nucleus thinly disseminated settlements extend east and west along the ridges nearest the harbor and along the outlying parts of the water front. Unlike more completely developed settlements, Prince Rupert has no outlying groups of residences, tourist service stations, and urban supply establishments strung along land transport lines which radiate from the city. The only such land transport line is the railway, and it occupied a narrow ledge between a high timber-covered bluff and the sea. Prince Rupert is an island of cultural landscape on an island of land. In spite of this lack of suburbs, Prince Rupert today occupies far too large an area in proportion to its population. As a result of this distended structure, public services such as schools, police, fire protection, and public conveniences such as sidewalks, conduits for lights, water, and sewage have to be extended greatly in order to serve small numbers of people in the outlying residence clusters. Consequently, the public debt was greatly increased when these services were installed, and maintenance and operating costs are far higher than the number of people warrant. As a result of the failure of additional taxpayers to move into the city, and especially into the scattered outlying areas, Prince Rupert was unable to meet current expenses in 1932 and was unable to retire a bond issue of 1913 which matured in 1933. Consequently on May 15, 1933, the city gave up its independent government by a locally elected council and continued under a commissioner appointed by the Provincial Government. Thus the great planned city of 1915 not only has failed to materialize but the overexpansion carried through in attempting to build such a large city has reacted indirectly to change even the original form of government.

FIGURE 9.—A row of fishermen's houses on the inland face of the central ridge. There is little room between these houses because the lots are narrow.

Why has Prince Rupert failed to reach the goals set in 1915? This is a question which must be answered in order to understand the present city.

## WHY THE CITY FAILED TO GROW

Prince Rupert has not developed as expected because: the hinterland in northern British Columbia has attracted few settlers; the outer or transmontane hinterland sends its exports through Vancouver rather than Prince Rupert; the tributary coastal belt has failed to

gain the industries and population expected; trade with the Orient has not grown; and, as a result of these conditions, few important commercial or manufacturing activities have been established within the city.

The Prince Rupert trade territory has few inhabitants because it does not have many rich resources that may be easily and quickly exploited. East of the coast range the timber is small, and few valuable mineral deposits have been opened. Agriculture is possible only in some of the larger valleys. Upper slopes are relatively inaccessible and are further handicapped by thin soils and short cool summers. Most of the farms are self sustaining units (Figure 12). The more important commercial farm products are livestock, garden vegetables, timothy seed, and timber from farm wood lots. Production of these commodities is small because the local market is small and the extra regional markets are well supplied from other sources.

Each year the northern Prairies, comprising the Edmonton upland, export several million bushels of wheat to the countries of western Europe. Most of this grain moves out through Vancouver via the southern branch of the Canadian National Railway (Table VII). This Edmonton to Vancouver railway was built in 1909–1915 as a part of the Canadian Northern Railway, a rival of the Grand Trunk Pacific. The wheat is shipped to western European markets by way of Vancouver rather than Prince Rupert, for several reasons. The southern railway is 191 miles shorter, and the steamer route from Vancouver to western Europe via the Panama Canal is 344 miles shorter than the Prince Rupert-Panama Canal route. Also, Vancouver has better port equipment.

In spite of these advantages of Vancouver, Prince Rupert might have obtained much of the grain export of the northern Prairies if the young energetic group of men in charge of the Grand Trunk Pacific had been given time to develop the port and the necessary ocean shipping facilities. However, such a possibility was eliminated by the collapse of the Prince Rupert boom during the slack period at the beginning of the World War, and the forced consolidation of the Grand Trunk Pacific and the Canadian Northern Railway to form the present Canadian National system. After the consolidation, officials of the newly united railways decided to route grain shipments from Edmonton over the old Canadian Northern line to the better equipped port of Vancouver. Their decision was supported by the fact that Prince Rupert at that time (1920–1922) did not have grain storage or loading equipment; and if such equipment were available any grain shipped through Prince Rupert would constitute merely a diversion of business from one branch of the new Canadian National Railway to another. No additional income would be gained for the railway to offset the expense of installing grain-handling machinery at Prince Rupert. As a result of this decision favoring Vancouver, the Canadian National Railway saved money, and Prince Rupert lost its best opportunity to become an important port. When the grain elevator was built in Prince Rupert several years later (1926), Vancouver had gained too great a lead to have much of the trade diverted to the northern port. Probably Prince Rupert would not have become a city of great size if the two rail-

TABLE VII

MOVEMENT OF GRAIN FROM PRAIRIE PROVINCES OF CANADA

Crop Year 1933–1934 *

| *From Prairies to* | *Amount in Bushels* |
|---|---|
| Eastern Canada (chiefly for export) | 164,920,872 |
| Port Churchill (Hudson Bay) | 2,707,891 |
| Prince Rupert | 1,091,904 |
| Vancouver | 51,778,919 |

* Crop Year Aug. 1, 1933 to July 31, 1934. Source: "Grain Trade of Canada for Crop Year 1933–34, Ottawa, 1935," p. 28.

ways from Edmonton to the sea had remained under separate private control, or even if the southern branch had not been built; but it seems probable that under either of those two circumstances the northern city would have gained enough trade to make it a completely developed port of considerably larger size than at present.

Exploitation of sea and shore resources in the sea zone tributary to Prince Rupert has been irregular. The halibut fishery has grown beyond the predictions of the founders of Prince Rupert and is today the mainstay of that city's economic life. The salmon fishery, on the other hand, contributes little to the prosperity of Prince Rupert because most of the Pacific Coast salmon are canned or smoked and, as a result, do not have to be rushed to a railhead port for shipment. There is very little entrepôt trade in the Prince Rupert coastal zone because the few cities there are small. Also, the Alaskan ports in this zone carry on most of their trade directly with Seattle, the nearest large American commercial center.

Because Prince Rupert has failed to obtain a large and regular flow of goods from its hinterland, the city has not been able to obtain regular sailing of vessels except in the coastwise trade. Consequently, the great volume of Oriental trade predicted in 1905–1915 has failed to materialize. Port service activities such as the dry dock and ship repair yard cannot flourish in the absence of extensive shipping.

The small volume of goods moving through Prince Rupert has meant a small volume and variety of raw materials available for manufacturing. Also, the restricted and sparsely populated hinterland offers a limited market for local manufactures as well as imported goods handled through wholesale houses. Consequently, no large manufacturing establishments have grown up in Prince Rupert, and the few local wholesale houses are of small size.

FIGURE 10.—Unoccupied land near the northeastern limits of Prince Rupert. Most of the lots sold in this area have long since been claimed by the government for unpaid taxes. On some of the unoccupied land young second growth conifers are larger than those shown here.

Prince Rupert has thus failed to reach the goals set in 1905–1915 except one, i.e., importance as a shipping point for fresh fish. How has this deflation of hopes and plans affected the people of Prince Rupert?

### REACTION OF THE POPULATION TO CHANGES IN URBAN FUNCTIONS

Changes in dominant functions of Prince Rupert have also created changes in the population. The present population of six thousand (Table III) is far smaller in number than the thirty thousand predicted in 1905. New racial elements have risen to prominence alongside the old British-Canadian stocks. The average age of the population has increased, and the people have lost much of the youthful optimistic spirit of the pioneer builders.

The chief ethnic groups that have increased greatly since 1915 are those from Sweden and Norway. Fishermen from these countries have been attracted to the halibut industry. The ability of these men to handle boats and to withstand exposure and hardship has made them invaluable in the offshore branch of the fishery. As the halibut fishing

industry has increased in relative importance in Prince Rupert, so have the Scandinavian fishermen.

Prince Rupert has lost her youth in more ways than one. As in all pioneer communities, the proportion of young people was great at first. When the boom burst in 1914–1915 many families of this lower age group moved away. Children born in Prince Rupert during the first years of settlement, 1909–1915, reached their majority during the world depression years, 1930–1936. Many of these also have drifted away, and more

FIGURE 11.—Prince Rupert's largest dairy farm is shown on the slope in the background. Below is the small dependent market garden enclosed by a stave fence. Manure from the dairy farm plus hard work by Orientals makes the market garden possible in spite of the originally unproductive soil. As a result of the poor soil no grain crops or hay are raised on the dairy farm, and less than one acre is in grass.

will go as soon as economic recovery creates better opportunities in the larger cities of Canada and the United States. While these native-born boys and girls have been growing up, their parents, the young people of 1905–1915 who stayed in Prince Rupert, have been growing older. As a result of all these factors the average age of the population has risen.

Prince Rupert likewise grew older in spirit. Pessimism and conservatism for a time replaced optimism as the dominant state of mind. Undoubtedly reaction to the loss of money, opportunity, and even hope which came during the world war years contributed as much to this attitude of defeatism as did the actual increase in age of the population. Gradually, however, the realization has come that Prince Rupert is destined to be neither a great port nor a great failure. Encouragement of the fishing industry and of trade with the interior valleys is a marked feature of recent business developments. The efforts of a local group of men to secure the proposed pulp mill, whether successful or not, is an indication of the reawakening of Prince Rupert.

Where will this new spirit lead? What is the probable future of the city?

## FUTURE OF THE CITY

Prince Rupert probably will change very little in the near future. However, local citizens are attempting to bring about two possible changes. These are: better communications with the interior, and the proposed pulp mill.

A railway line to the Peace River country is the most discussed link with the interior. Several of the proposed routes for this new railway terminate at Prince Rupert. If Prince Rupert does become the terminus of a new Peace River outlet, trade of the city will increase slightly, and more railway and administrative functions will be created. Other benefits are doubtful because the Peace River country is sparsely settled, having a population of only 35,953 people in 1931. The volume of goods sent out of the Peace River country also is small, amounting to only 409,110 tons of grain and 6,925 head of livestock in 1931. Also it is probable that Vancouver will continue to be the chief port for the Peace River country if a new rail outlet is built. Vancouver now handles most of the Peace River exports, via Edmonton, and if the demand for a more direct route to the coast becomes imperative the southern port probably will ob-

tain this by means of a short route north from Obed, east of the mountains, or by extending the Pacific Great Eastern Railway northward through Prince George (Figure 1).

At present there is little possibility that any new Peace River outlet will be built. The Dominion Government cannot afford the $30,000,000 to $80,000,000 necessary for the construction of the new line. Also, the old line through Edmonton is now subsidized in order that it may quote grain rates low enough to help the Peace River farmers.

FIGURE 12.—A pioneer farm on recently cleared land in the upper Fraser Valley. Each settler obtains a small cash return for the small saw logs, poles, and ties which he cuts from the timber on his holdings. The thin forest on the distant ridges has been burned.

Erection of the proposed pulp mill would cause marked changes in the functions and cultural landscape of Prince Rupert. Both construction and operation of the mill would require more labor than is available within the city. This situation would necessitate importation of additional laborers and their families, thus increasing the population and causing a mild building boom in areas near the proposed mill site, i.e., the shipyard. Prince Rupert merchants, service industries, and local tax-supported activities would benefit greatly from the wages and other sums spent within the community. Construction of the pulp mill is uncertain in spite of the advantages of Prince Rupert's fine land and water transport facilities, and the large available supplies of cheap pulp wood and water power. As late as January 1937 the author was informed by the editor of the *Pacific Pulp and Paper Magazine* that the mill would be constructed as soon as enough bonds could be sold to finance the undertaking. Probably these bonds cannot be sold until improved economic conditions assure a better market for the pulp and a more certain return on the bonds.

A slight but persistent threat to Prince Rupert's most important industry is the slow steady decline of the stock of halibut on the fishing grounds tributary to the city. These grounds, most of them on the British Columbia Coast, were overfished for many years. This overfishing and other uneconomic methods have been reduced during the last few years through joint action of the United States and Canadian governments and the halibut fishermen. However, the fishermen intend to abandon their self-imposed restrictions as soon as better times bring better prices for halibut. If there is not a complementary tightening of the governmental regulations a continued decline and eventual extinction of the fishery will ensue.

A slow and irregular increase in the trade of Prince Rupert merchants may be expected as a result of the gradual increase in the farming population of the interior valleys. A highway is slowly being extended up the Skeena Valley parallel to the railway. When this road reaches the more productive interior valleys, the Prince Rupert merchants will receive the benefit of cheaper transport rates to these trade areas. If the highway is extended all the way to the completed north-south highway at Prince George, a small increase in the tourist trade also should ensue.

With the exception of the proposed pulp mill, most of the marked changes which may affect Prince Rupert cannot

take effect for several years. Prince Rupert, therefore, after a rapidly changing youth has reached the comparative stability of middle age.

## SUMMARY AND CONCLUSIONS

Prince Rupert was built to serve as the Pacific port and terminus of the Grand Trunk Pacific Railway. The completion of the city in 1915 marked the end of the great period of transcontinental railway building in western North America.

The situation of Prince Rupert is excellent for inland communication, via the Skeena Valley, but poor for overseas trade with the great markets in western Europe and eastern North America. The site is somewhat better than that of most settlements along the north Pacific Coast because there is available an extensive area of nearly level land on a large deep harbor that is never blocked by ice although sometimes obscured by fog.

Prince Rupert was planned on a grand scale as a world port and an important manufacturing center. These planned functions have not materialized because the city's inner hinterland has failed to grow as expected, the trade of the outer hinterland has been lost to Vancouver, and the tributary coastal zone has produced an important halibut fishery but has not developed commercially. Consequently, Prince Rupert is a small city chiefly supported by the halibut fishing industry and the railway. The fresh halibut are landed at Prince Rupert because it is the railhead port nearest the northern fishing grounds. This again emphasizes the dependence of the city on its creator, the railway. Rise of the fishing industry has attracted large numbers of sturdy Scandinavian fishermen who are now taking part in many other phases of civic life.

As a result of Prince Rupert's failure to become a great city, its planned structure is much too large for the present population. Certain outer sections are so sparsely inhabited that eventually they must be abandoned or their maintenance will become an intolerable burden. In contrast with this the adjustment of the street pattern to the topography and drainage of the site was well planned and executed.

Increasing age and less favorable outlook for the city have brought corresponding increases in the average age and maturity of viewpoint of the population.

Probably Prince Rupert will gain population very slowly, depending largely upon its present dominant functions for support. Discontinuance of rapid railway service to the East or decline of the halibut fishery would bring disaster. On the other hand, building of the proposed pulp mill in the city would cause expansion and renewed prosperity. All of these changes are only remotely possible.

The future of Prince Rupert will remain uncertain as long as it depends chiefly upon self-destructive industries, such as fishing and lumbering. The danger of such dependence may be lessened by reducing the drain on the fish and forest resources. Such an attempt at conservation has recently been made by the halibut fishing industry. Greater security may be obtained if agriculture is better developed in the interior valleys of northern British Columbia. If agriculture is expanded in these lowlands, Prince Rupert not only would benefit from more trade with the farmers, but the increased business of the railway would remove the possibility of serious reduction or discontinuance of railway service.

Several generalizations concerning town planning are derived from a study of Prince Rupert. These are: in plan-

ning a new city land prices should be kept low, and to help maintain this condition all surplus unoccupied land must be under public ownership or control. The total area of the planned structure should be kept within reasonable bounds. The reserved outer areas may be planned and platted but not opened for sale until needed by home seekers rather than speculators. Street and lot widths should be of sizes to permit a much denser settlement and heavier traffic flow than may be apparent at the time the plan is made. This was done in Prince Rupert. Very little public financial support should be promised or given to privately owned towns or urban units because such burdens once assumed, as in Prince Rupert, are almost impossible to drop and generally are increasingly expensive. These generalizations are not new, but are restated here because their validity is substantiated by developments in the planned city of Prince Rupert. Contemplation of such conclusions may be of some aid to those who control the various "ideal" or "model" towns that are now being planned and built.

Prince Rupert has passed through the usual stages of the pioneer railway towns of western Canada. These are: rapid growth to over-expansion of structure; collapse of original plans followed by gradual readjustment of the cultural landscape forms to the remaining, and hence dominant, functions; slow structural readjustment due to original overplanning and scattering of forms plus concentration of land ownership in hands of absentees; and finally the awakening of the people to possibilities of other activities than those originally planned. In the future Prince Rupert may change greatly; but there is little probability that any marked change will come within the next few years.

In addition to field maps and other observations made at Prince Rupert the chief sources of information for this paper are: Mr. J. H. Pillsbury and Mr. W. H. Tobey, two of the founders of Prince Rupert, Mr. A. Brooksbank and other citizens of Prince Rupert, Mr. N. J. Thomson, Industrial Commissioner, Canadian National Railways, Montreal; "The Pacific Fisherman," "The Pacific Pulp and Paper Industry," "The Prince Rupert Daily News," and various publications of the Province of British Columbia and the Dominion of Canada. Other minor or secondary sources are not listed.

# OTOMI INDIANS OF MEZQUITAL VALLEY, HIDALGO

*H. C. Lanks*

THE Mezquital Valley, which is drained by the Tula River, lies along the Pan-American highway in the State of Hidalgo, Mexico. A rainfall of less than 20 inches a year supports a sparse vegetation of cactus, mesquite, and maguey. Apparently little human life or interest accrues to the dry valley, except for a few native Indians and their activities, which attract attention by their unusual character. Each Indian, young or old, male or female, seems to be spinning a thread from a bundle of coarse fiber carried under the arm, on the shoulder, or even on the head. The spinning is done by means of a little clay disk on a peg, dexterously whirled between the fingers. Especially the women engage in this strange occupation as they trudge along carrying huge burdens or, what is more likely, bearing a child peeping out with large, black eyes from the folds of the shawl swung over the mother's back. Who are these strange, seriously engaged people, and why are they so continually occupied with this spinning, apparently during all the waking hours of their day?

FIGURE 1.—The shaded part of the state of Hidalgo is the area studied. It forms a distinct geographical unit the limits of which are determined by such natural boundaries as mountain ridges, large stretches of uninhabited, desert-like land, or water courses. However, the chief distinction of this area is its economic limitations as described in the article. To the east is one of the richest mining sections of all Mexico; similarly in other directions there are other resources of mining and irrigable land. This particular area is an island of low economic resources coupled with a distinct economo-cultural development of the people to which the inhabitants are tenaciously attached.

They are the Otomi Indians, of whom there are about a third of a million scattered over the central plateau of Mexico. In the Mezquital Valley of the State of Hidalgo they are most primitive and most busily occupied with their interminable, peripatetic hand-spinning. Here, centered about the town of Ixmiquilpan, live sixty thousand of the Otomi, bound by economic and social forces to an apparently inescapable fate of subsistence level of existence. They are little changed from the mode of their life in the pre-Conquest period.

## THEIR ORIGIN

Historians quite generally agree that originally the Otomi were a nomadic people whose name comes from the Nahuatl word "Otomitl," meaning wanderer. Long before the coming of white man this group of the Otomi were forced by threat of conquest into the arid and unfertile Mezquital Valley, where they gained a miserable livelihood from the scarce game and the few wild herbs and seeds of the region. Trapped in the isolated valley, they gradually consumed the means of their own existence. Their main source of meat, the deer and the rabbit, disappeared by ruthless hunting enforced by pressure of increasing generations of people, and

finally even the mesquite brush, important to man and beast, could not withstand their double draft upon it, and disappeared as well. In time not much more than the hardy cactus-like maguey plants survived; the hard-pressed people gradually had to resort more and more to them as a means of livelihood. Unwilling to pursue agriculture and perhaps unable to, because of the aridness of the region, they gradually came to rely upon bartering and selling the products of their spinning and weaving crafts for food and other necessities. The different species of maguey plants of the region furnished the necessary fibers for their crafts and furnished pulque, the beverage which supplied the alcoholic Nirvana of their miserable existence.

The Otomi Indians are said originally to have been a part of the Chichimeca people who migrated into Mexico from the north in two main streams, of which one stream is supposed to have come down the central plateau of Mexico, and settled there to become the founders of the civilization of central Mexico. The other stream, from which the Otomi are said to have sprung, is believed to have come down along the east coast bordering on the Gulf of Mexico. From thence it flowed up the valleys into central Mexico. The Otomi of this latter group it is believed appeared in the valley of Mexico by about 500–600 A.D., or a thousand years before the coming of the white man, and settled not far northwest of the present city of Mexico.

It seems that the Otomi resisted settling into an agricultural life, subsisting by hunting and gathering wild fruits and seeds. They naturally came into contact with the Aztecs in the section, but withstood their domination by moving about. Aztec records indicate some primitive desultory bartering with them at the borders without any such institution as the market which has since developed. Neighboring peoples developed increased demand for their twisted and woven products of the maguey fiber, as well as for their wild fruits, medicinal herbs, and game skins.

FIGURE 2.—General view showing nature of some of the terrain of the country with some wild agave or lechuguilla, one of the sources of fiber, in the foreground.

With the spread of the domination of the growing Aztec empire, repeated attempts were made to subjugate their Otomi neighbors. However, for the most part, the Otomi were able to hold their own against the Aztec domination, —as a last resort by migrating to the north, part into this semi-arid, inaccessible Mezquital Valley where they reside today, still surviving by means of their primitive handicrafts.

Nor did the coming of the white man change their lives materially. Although living a more sedentary life, the Mezquital Otomi still continue their quite independent and non-agricultural existence. For the main part they eke out a miserable economic existence today by means of the same crafts of a thousand years ago, trading the products of their handicraft for other necessities of life.

## HOME HANDICRAFT PEOPLE

Each typical Otomi Indian home forms a complete manufacturing unit which collects its own fiber, cleans it,

spins and twists or weaves it into the finished articles of commerce. Each family thus competes with every other in determining the selling price of their products in the markets. Thus, each Otomi is an independent worker, an independent entrepreneur. Just as a thousand years ago he would not work for others, so today he persists in independence. Neither Indian nor white conqueror has succeeded through the ages in making him bow to the yoke of peonage or to wage labor. He persists today as an independent craftsman, although ground down to a subsistence level because of fierce competition with nature, fellow man, and machines. He has been forced to depend upon securing his food more and more by trading the products of his handicraft for corn, the one major subsistence food of all Mexico. As he could not raise the corn in his own section because of its aridity, he gradually came to depend upon his neighbors for his food supply until today he is almost entirely dependent upon others for it. He confines himself to the fabrication of products from maguey fibers.

FIGURE 3.—A plantation of the cultivated maguey which of course is larger and yields more fiber and beverage pulque.

## RAW PRODUCTS

The many species of maguey, wild and semi-cultivated, of the region go by names in the Otomi language, spoken exclusively by the Indians among themselves. They call the black maguey boomnda' or boota' in Otomi; the white maguey, tach-guada'; the thin jointed maguey, tziye'; the green or blue maguey, can-guada'; the thick thorned maguey, domini'; the soft maguey, masho'; the large jointed or Mexican maguey, mayee', and the hard maguey, mamnda. Some others have no names that can be translated into English.

From the various maguey plants they obtain both the maguey fiber and the juice for making their national beverage, pulque. The yellow maguey, called ercash-guada, does not produce pulque. The fiber of the plants is called "ixtle" in Mexican and "santhe' " in Otomi.

In addition to the above-mentioned ixtle or santhe' fiber from the pulque-yielding magueyes, the jarcia fiber is obtained from a wild agave called lechuguilla, or in Otomi tzita'. The lechuguillas, not having been selected through ages and left uncared for, are much smaller, and vary considerably in kind of fiber. Several locally called tzita' produce much thicker and rougher fiber; and one locally called guaja' produces fiber approaching cultivated maguey. It is a wild maguey, and, although not producing as much fiber to the leaf stalk, is easier to work. Therefore, even cultivated maguey is carelessly attended, more for the liquor pulque than fiber. Bottom leaf stalks are constantly removed from season to season, which is as much for the purpose of stimulating growth for pulque as for securing fiber. The maguey plant is milked of sap for

all the pulque possible, and the entire plant is then used for fiber.

Two methods of removing the fiber from the leaf stalks after they are cut prevail; the raw or crude method, and the cooking method or "tatemado." The crude method, which is most utilized, is generally followed by two persons. After the spines and thorns are removed the pulp of the stalk is crushed by beating with a wooden club on a stone. Then the crushed pulp and juice is separated from the fiber by taking half the leaf stalk at a time and working it with a crude iron scraper on a board inclined away from the body. The scraping board rests one end on the ground and the other end on a crosspiece fastened between two poles in the ground, waist high to the worker. The fiber of one half is scraped clean, after which the other half is turned around and similarly scraped clean. After the leaf stalk is thus scraped as clean as possible, the loose fiber is washed in soap and water, or in corn water. The fiber is dried and tied into bundles of from five to ten stalks, and then is ready for the family industry. If sold as prime material the fiber is merely dried without being washed.

The other system of working the fiber merely consists of half cooking and fermenting the stalk before scraping. Semi-cooking is done over a wood fire, after which the stalks are thrown into a hole in the ground, covered with earth and allowed to ferment for a couple of days, after which the scraping is accomplished much more easily. Subsequently the procedure is the same.

In either method of preparation the fiber of the upper middle parts of the stalk might be separated from that of the lower part, the former being finer and hence used for cloth, while the coarser fiber from the lower part is used for rope making. For very fine work the interior leaf stalks, which are cut out to get liquor for pulque, are used. However, not much of them can be secured. In the processes of cleaning fiber two men average about fifty stalks together in six or eight hours a day. They receive about ten centavos ($.026 gold) per bunch of fiber in the market place. The cutting, working and transporting reduces the average daily income to about 70 centavos per person per day, which amounts to less than 20 cents American gold. Each maguey plant produces about 600 grams of fiber, or about some 70 feet of rope.

FIGURE 4.—Landscape showing nature of terrain in the valleys with fine example of the magué dominí in foreground, source of fiber and the beverage pulque.

Cleaning the fiber is man's task. It is rather heavy work. However, with the cooking method in some localities, the task is left for women. In such case, women work the fiber in much the same manner as they grind corn, that is from a kneeling position on a surface, the board sloping away from the body. Gathering leaf stalks is generally done by men, either on back or by burro. Sometimes the leaf stalks are cut from the Indian's own allotment of ground and sometimes cut from land owned by others. In the latter case, of course, the owners are paid for in money or kind.

One bunch (275 grams) of fiber is worth 10 centavos, or less than 3 cents in American money. Ten per cent is "alcabala," or government sales tax. Twenty-five per cent must be given as payment for maguey leaf stalks in case they are not owned. Nearly 8 per cent represents transportation costs. This leaves about 60 per cent of a selling price, or 6 centavos Mexican money (1.7 cents American money) to pay for the working of the fiber. As one man can do five bunches a day he receives the equivalent of 30 centavos, or about 8½ cents American money a day for the work. Of course, if the family had to depend upon this wage from the head of the family they could not exist even with their very simple needs of food, drink, and little clothing. The income is augmented by the product obtained from the continuous working of the entire family in the twisting, spinning, and weaving processes, day after day.

FIGURE 5.—The process of cleaning and drying the ixtle fiber. After the leaf stalk is mashed with a wooden club, the loose pulp is scraped from the fiber with a crude iron scraper.

### FABRICATION OF RAW PRODUCTS

After raw fiber is prepared, the next step is fabricating the finished products for market, in some cases merely a twisting process in spinning for more elaborated products which are woven. Whatever the finished product, it is fabricated entirely in the home, seldom by a wage system. The main types of finished products in order of importance are: first, various types of fiber cloth called "ayate"; second, ropes and twines; third, various articles of harness nature for carrying things by man or beast.

Ayate or fiber cloths vary greatly from crude, loosely woven, coarse fibered material like burlap bags to fine-meshed material of rich adornment used for women's handbags. Some of the latter are so fine and beautiful that they make them only for themselves and will not part with them at any price. Altogether they probably market about 260,000 pieces of fiber cloth material a year worth 150,000 pesos, Mexican money, or $42,000 American money.

Spinning of fiber is accomplished by the crudest, most archaic type of spinning disk imaginable, merely a clay disk 2½ inches in diameter attached to the end of a thin stick about 15 inches long, with a notch on the opposite end into which is set the fiber for spinning. The fiber is fed to the crude instrument by the left hand while the spinner wets the fiber with saliva and turns it continuously with his right hand. Fiber is carried in a hank around the neck, leaving the whole body free to move about at will while continuing spinning. To spin enough fiber by such a crude method, all members of the family work at it continuously. They spin while walking along the highways, while traveling in the fields, while chatting, while sitting in the market place, while tending flocks, while carrying burdens, everywhere,

anywhere, wherever the hands are free. In some places now they are beginning to use a crude spinning wheel turned by a crank arrangement rigged up by local craftsmen. As such an apparatus involves an outlay of perhaps 15 pesos or several weeks' work, and since they are practically on the border line of subsistence, they find it difficult to make the sacrifice necessary to possess one. Furthermore, it is not portable like the primitive spinning disk. If the fiber is sold just as fiber thread before weaving, which is seldom done, a woman can spin enough thread a day to earn about 30 centavos Mexican, or a little over 8 cents American money.

The weaving apparatus is as crude and primitive as the spinning apparatus, undoubtedly the same as in pre-Hispanic times, a mere framework of poles with crude shuttle woven in and out between the fiber threads strung on the framework. All crude apparatus for spinning and weaving can be bought in the market place for 70 centavos Mexican money, or about 20 cents American money. Lately a trend toward coöperating has exhibited itself, by which a worker is paid by the time or piece; the major part of the production is still done under the domestic system of production in which all members of the family, children as well as elders, take part.

The outline following gives some idea of the weekly routine of the typical Otomi family. It begins Tuesday, because Monday is market day.

FIGURE 6.—Many of the Otomi homes are miserable one-room huts of poles and thatched roof. Growing organ and nopal cactus might be used as the courtyard fence to restrain whatever domestic animals the household possesses, if any.

## MARKET DAY

Indian market day is an institution characteristic of the aborigines of Mexico, and for that matter, of most of Latin America. It has its roots in the dim past of antiquity. It always was a periodic affair, probably at some interval of nearly a week. It is somewhat like the medieval fairs of Europe, although more frequent and not quite so elaborate. On the other hand, it is more elaborate than the farmers' market days of our times, serving many other purposes than just marketing. It is more of a holiday to them, satisfying their need of social intercourse in a larger way than mere family and community relations. Formerly it had religious and political significance in addition to filling commercial need. In fact, today the social significance of

### TUESDAY

| *Man* | *Woman* |
|---|---|
| Spends half day cutting and transporting 50 stalks maguey. In the afternoon he visits friends who may have pulque to drink and while "socializing" with them may spin half hank of fiber. | Does the work around the home, cooking, washing, and caring for the children if any. Washes fiber prepared by men the week before, for the current week's weaving. |

### WEDNESDAY

| *Man* | *Woman* |
|---|---|
| Spends a half day cutting and transporting wood to bake leaf stalks of maguey for easier working; afternoon spends in rest, spinning perhaps another half hank of fiber. | Does work about the house, assists the man in baking maguey stalks, also spins half hank of fiber, and makes her substantial contribution to the income. |

THURSDAY

| *Man* | *Woman* |
|---|---|
| Spins all day about hank and a half of fiber. | Does housework and spins about a hank of fiber. |

FRIDAY

| *Man* | *Woman* |
|---|---|
| Begins working fiber from half cooked maguey stalks, which have been allowed to ferment several days. | Does housework and helps her husband work fiber from the maguey stalks. Sometimes she does this latter alone while he spins. |

SATURDAY

| *Man* | *Woman* |
|---|---|
| Spins all day about a hank and a half of fiber. | Does housework and weaves three hanks of fiber into cloth. |

SUNDAY

| *Man* | *Woman* |
|---|---|
| Spins all day about one and a half hanks of fiber. | Does housework and weaves three hanks of fiber into cloth. |

MONDAY

*Man* *Woman*

Both journey to market to sell their product and enjoy the day in festivities and spending.

FIGURE 7.—A community store, example of the later and more substantial type of structure, which is being encouraged by federal government agents.

the market would seem to be of more importance than the commercial, if judged by the amount of time spent in either.

Journey to market often begins hours before daybreak, for some of the market places are many miles distant. The market place is generally the largest nearby town. On the way the women might wash the fiber cloth to present a better appearance in the market, allowing it to dry on the journey. The whole family makes the weekly journey to market; those too young to walk proceed on the backs of parents or the ubiquitous donkey. As the family is overtaken by other families the group grows, until early morning finds constant streams of people coming into the market town.

The market place is generally the open central square of the town. All squat down with their wares in front of them. All the products of the neighborhood that are made for eventual sale elsewhere are displayed. In addition, many vendors of articles for their own local needs are intermingled. Goods from all over find their way into the market places. Regular stores are depended upon to furnish more constant local demands. Some works of craft for which the locality is noted are purchased by itinerant purchasers, but most of them are purchased by regular commission buyers who send them to great industrial centers. Although prices seem to be a result of eternal haggling, there is a lowest price below which the owners will not go, which might be considered subsistence level price. Regular buyers know the price as well as sellers, and so they quickly arrive at the price where goods change hands.

An Otomi family, having disposed of its wares, goes on a spending spree. After buying necessary corn for the coming weeks, together with any other

FIGURE 8.—In the higher altitudes, board structures are used especially if a public building as shown, which is a small coöperative store. The federal government is fostering the uplift of the people by means of such community projects.

pressing necessity for the family, a pair of sandals, a shawl or a piece of pottery or kitchen utensils, the man of the family joins his friends in the cantinas, drinking enormous quantities of pulque. His wife joins him with more moderation and attempts to restrain his orgy—with more or less success. Itinerant musicians contribute to the gayety of the scene. The children play, neglected, in the festive streets. Late in the day or evening the family is gathered together and trudges its weary way homeward to another weekly routine of toil.

The market day affair probably did not originate with the Otomi. The custom was likely adopted from their Indian neighbors, possibly the Aztecs. When the Otomi first migrated into the region which they now occupy, they did not have the quantities of products to sell which they have now. Articles of handicraft were only an incidental line to their hunting and pastoral existence. Forced to depend more and more upon trade for food, they came to look upon the market day as the one relief of their humdrum lives, as did their neighbors.

## WILD MAGUEY

So far making of the maguey fiber cloths which are made from the cultivated maguey have been described. There are many species of wild maguey, of which the fiber is shorter and coarser. The fibers are generally used for making ropes and twines and harness apparatus for man and beast, like cinches, although the lower and coarser fiber of the cultivated plant is also used for ropes. The source of the plants is either from land owned by the family, from communal land, or from large holdings of proprietors. In the latter case it is supplied on a share basis of fiber. Since the wild maguey is much smaller than the cultivated ones, it furnishes less fiber. It is cleaned in a somewhat similar way, however.

The twisting of the coarser fiber into rope is accomplished by two persons, one turning the apparatus for twisting and the other feeding the fiber. The apparatus consists of the spinning disk mounted on a spindle, one end of which is grasped in turning, and the other of which holds the end of the fiber rope

FIGURE 9.—In the market place the vendor simply squats on the ground with the products or wares for sale spread before her. Much haggling about the price might take place but it generally settles down to the conventional least price that can be accepted.

being twisted by means of a peg or bolt at the end. The person doing the twisting steps backward as the rope being shaped lengthens, while the other remains seated with a bag of fiber which he has to untangle and feed dexterously.

After one strand of rope is twisted, it may be doubled a number of times to form thicker ropes depending upon the size required. The twisting is done in early morning or late day when sufficient humidity makes the fiber more flexible. At times the last operation is only accomplished by means of a four-point windlass affair which twists the four already fabricated smaller strands together. From all the different sizes of twines and ropes various pieces of more complicated articles are woven or braided, such as cinches and carrying harnesses for donkeys, porters' carrying straps, and special apparatus. In making all the various articles there is little difference in earning ability. Under the fierce competition and low buying power of the purchasers, earnings are kept down to mere subsistence level.

FIGURE 10.—Otomi family group of the highest, in this case the leading judge of the community. The reboso or shawl in which the young baby is often carried on the mother's back is typical. Footwear when it is worn at all is the locally made huaraches or sandals.

### LIVING STANDARDS

Some idea of the living standard provided by the methods of livelihood can be obtained from the fact that an average family of five consumes within a week about twenty-six kilograms of corn, six kilograms of beans, one kilogram of peppers, one kilogram of tomatoes, onions, salt and garlic as bare necessities of food. To this it adds fourteen liters of pulque beverage if just the two parents drink, and seventeen liters if the children drink. On market day they might consume some bread in the town. In addition they might, if their earning power is slightly better than that of their neighbors, add more pulque, after which they might consume any or all of the following: five hundred grams of lard, two kilograms of sugar, seven hundred and fifty grams of bread, one thousand grams of meat, two hundred and fifty grams of flour products, macaroni, two hundred and fifty grams of rice, one thousand grams of fruit, two hundred and fifty grams of coffee. The figures given are a reasonable maximum. Each family is an individual unit and might emphasize one item at the expense of others.

In monetary terms the typical family of five might earn two and a half pesos a week, an eighth of which goes for taxes, a consuming power of about 60 cents American money for a family of five per week. The minimum food cost

per year is about 17 pesos Mexican money, or $4.76 American money; the maximum is 156 pesos, or $43 American. The minimum is doubled when the beverage, pulque, is added, although it becomes an increasingly less per cent where the earning power is higher. The dress cost per person per year ranges from 11 pesos ($3 American) to 70 pesos ($19 American). Shelter represents no expense, for many families live in huts which cost nothing. The entire family might spend 5 pesos ($1.40 American) a year which might be spent for fireworks, fiesta day expenses, church contributions, and extra tidbits of food. Altogether the typical Otomi individual consumes annually from 84 pesos as a minimum to nearly 400 pesos as a maximum ($24 to $112 per year American). Very few enjoy the maximum, however.

FIGURE 12.—The inhabitants of a typical Otomi community in front of their latest project, the community theater. By fostering such projects as these, the Mexican government is attempting to raise the people to a higher cultural and eventually a higher economic existence.

FIGURE 11.—The Otomi Indian spins the ixtle fiber as he walks along or sits in social gatherings; so pressed is he to get sufficient fiber to earn his subsistence level of existence.

The beverage, pulque, which seems to loom so large in their cost of living, in many cases represents nearly a third of the total cost. The brutalizing effect of this mildly intoxicating drink has been much discussed. It is the fermented juice of the maguey plant, and averages a low content of alcohol. It must be drunk in large quantities, therefore, to be intoxicating. For the present it seems to be the main relief from a miserable life at subsistence level. It was formerly thought by the government that the lot of the Indian would be improved if the evil of pulque were removed. However, it has since been found by scientific investigation that the drink is probably a vital necessity for some, with their unbalanced subsistence diet, for it has been found to contain vitamins A, B, and E, proteins, fats, yeast, and amido acids. It is doubtful if the race could have survived on their limited diet without this balancing food beverage.

What does the future hold for these people? It is doubtful if they can es-

cape from their own cycle of miserable existence. By degrees some have escaped by turning to agriculture in more favored irrigable sections, others in the mines in surrounding provinces. However, they do not work well under a wage system. For instance, when the government built the international highway through their section they could not employ the Otomi on simple road work, but found it necessary to import labor. Enough migrate from the region to relieve bringing the question of existence to a hasty climax. The government realizes the need of some outside assistance and is now conducting a thorough investigation by the Institute of Social Research conducted by the National University of various means of raising the economic level of the people.

# MANUFACTURING DISTRICTS OF THE UNITED STATES

*Alfred J. Wright*

THE accompanying map (Figure 1) shows the manufacturing districts of the United States. Unlike several other maps representing this phenomenon, the basis for appraisal is value added to materials by the manufacturing process.

Sten de Geer delineated the American Manufacturing Belt on the basis of wage earners in manufacturing for cities of 10,000 population or more. In the discussion of redistribution of manufacturing, both Thompson and Creamer used the Census unit of Industrial Areas, based on the number of wage jobs.

Dr. Strong employed the horsepower of prime movers as a base to appraise manufacturing intensity.

Hartshorne used a modification of the number of wage earners, but did not map the United States manufacturing strictly as an areal phenomenon. His map shows the comparative importance of manufacturing as a livelihood within cities; by subtracting 10 per cent of the total population from wage earners in manufacturing, an "export" manufacturing rating is arrived at.

Important contributions to the study of manufacturing regions are: Sten de Geer, American Manufacturing Belt, Geografiska Annaler, 1927, Arg. IX, Haft 4, pp. 233–259; Tracy E. Thompson, Location of Manufacturing Industries in U. S., 1899–1929, monograph of the Census Bureau, Washington, 1931; D. B. Creamer, Is Industry Decentralizing? Philadelphia, 1935, U. of P. Press; Helen M. Strong, Manufacturing Intensity, U. S., Annals of Association of American Geographers, April, 1936; R. Hartshorne, A New Map of the Manufacturing Belt of North America, ECONOMIC GEOGRAPHY, January 1, 1936, pp. 45–53.

## ALL PRODUCTIVE FACTORS

Geographers may be interested in observing the localization of manufacturing in the United States on the basis of all factors in production. This type of appraisal appears to have been more generally considered in discussions of agricultural land use than in manufacturing.

In view of the fact that manufacturing comprises proportions of materials, fuel, labor, and capital which vary from place to place and from time to time, it would seem that no appraisal of its areal distribution or intensity can be based on any one of these factors alone. In manufacturing, the field is not so simple as that of agriculture or mining. It does not consist simply in adding value to given raw materials within a single establishment. The manufacture of most products is divided among a number of plants, each specialized in one or more stages of production, the materials passing from one plant to another until the processing is finally completed. This tendency to increase the roundaboutness of manufacture characterizes United States industry, although of course in some plants there is a tendency to telescope processes by the use of a series of semi-automatic machines.

## VALUE ADDED BY MANUFACTURING

As among the several factors of production noted above, which might serve as "measuring sticks," difficulties at once appear in the availability of data relating to capital especially, but also to labor, power, and value of the product. The

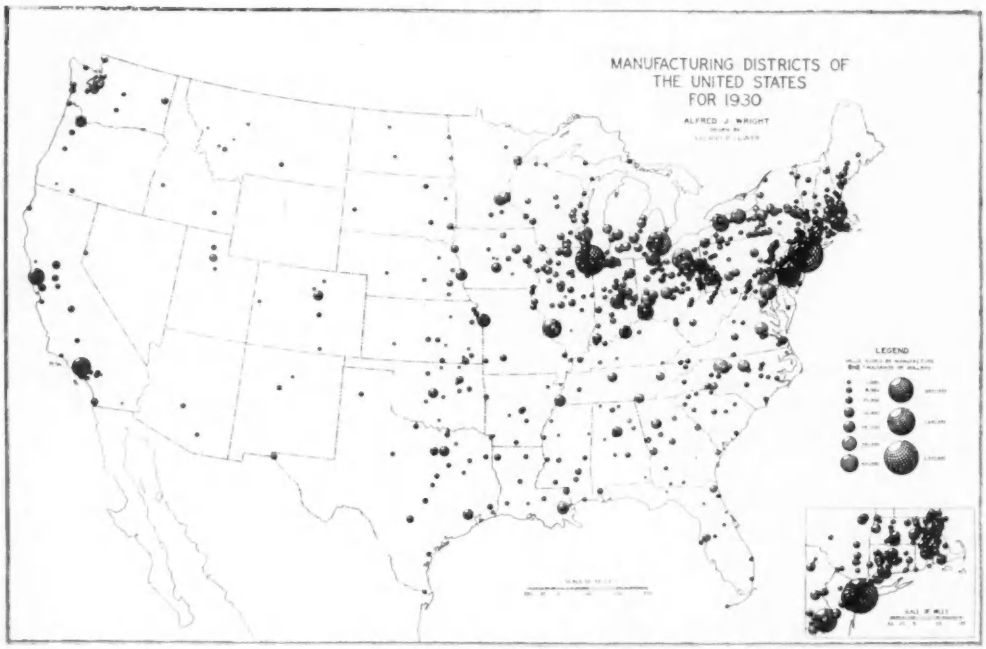


FIGURE 1.—The manufacturing districts of the United States have been determined on the basis of value added to materials by manufacturing, for all cities of 10,000 population or more.

roundaboutness of our manufacturing is discernable in value-added which is relatively free from the duplication inherent in gross value of factory products. This is in a sense a weighted base, since it includes all factors of production. Such a base is especially useful in mapping manufacturing in the United States, where the value added to materials by manufacturing is a third greater than Great Britain and Germany combined; where installed horsepower is twice that of these two countries; but where wage earners in manufacturing number approximately two-thirds those of the two European nations. This difference in the combinations of productive factors in manufacturing is of especial concern to economic geographers.

## DECLINING PROPORTION OF LABOR

Down to 1920 each census of the United States showed marked increase in the number of wage earners in manufacturing, but since 1920 there has been a contraction in the number of wage earners, in the face of continued population growth. The disparity between the increasing production, both total and per wage earner, in manufacturing, on the one hand, and the proportional decrease in number of wage earners on the other, is not peculiar to this country alone. Western European countries reveal the same trend, although not so marked in degree.

## CAPITAL

Next consider briefly the desirability of other bases for appraising the distribution of United States manufacturing. Data concerning capital as a factor in production are difficult to obtain, so difficult in fact that the census no longer reports this inquiry. Capital in any form is elusive as a ponderable factor in manufacturing. For instance, in power-generating or power-transforming equipment it is impossible to reach any signifi-

cant relation between either the cost of the machines, the amount of horsepower consumed, or the value they create. Big machines requiring great power may cost no more and add no more to the value of the product than small and intricate machines needing but little power. Except through value added to materials, this factor appears incapable of being weighted.

### CAPACITY OF PRIME MOVERS

This base will adequately measure but one phenomenon, and that is installed horsepower. As a unit for appraising manufacturing distribution it lacks much. Some of these weaknesses were mentioned under capital.

### GROSS VALUE OF PRODUCT

Although often used as a base for appraising manufacturing distribution, the pyramiding of value inherent in this figure makes it a poor measuring stick. The duplication of value over the actual factory value of manufactured output for the consumer was estimated by Tracy E. Thompson in "Net Value of Manufactures," *American Economic Review*, December 1932, p. 660, to be 49 per cent in 1929. This duplication certainly is greater in the leading manufacturing districts than in those of less importance, thus making regional comparisons unfeasible.

### WAGE EARNERS

Most frequently used base for determining the distribution of manufacturing is number of wage earners. In view of what has been said about machinery appraisal in a foregoing paragraph, this base is of limited value.

One fact must be noted for the num-

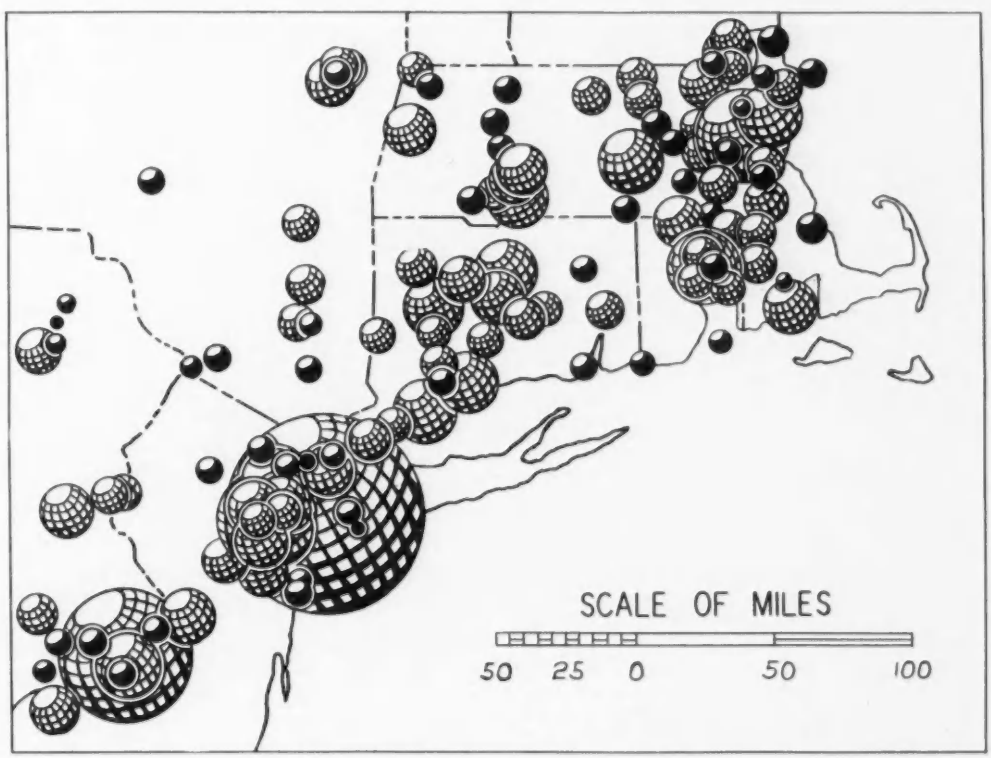


FIGURE 2.—An enlarged presentation of the density of manufacturing in the New England-New York industrial section, obscured by reduction in the map of United States manufacturing districts.

ber of wage earners as a base, the proportion of value added by manufacturing which is assignable to wages and salaries exceeds 50 per cent for many industries. However, there are wide differences in the relation between the number of wage earners and the amount of capital used, as well as differences in the rate of return secured on that capital. These differences, together with the wide differences in wages themselves, cause marked disparity between some ranking industries, in terms of the two bases, wage earners, and value added by manufacturing.

### MODIFIED WAGE EARNERS

Whether the number of wage earners is taken as a base, as in de Geer, or some modification of this, as by Hartshorne, the fact remains that appraisal is by one productive factor only. Furthermore, a map of wage earners in manufacturing which attempts to separate the manufacture by "ubiquities" from "concentrated" items, as worked out by Hartshorne, is essentially a comparative distribution of the manufacturing industries. The "export ratio" in manufacturing appears to be of no greater significance than in the case of agricultural markets classed similarly.

There is reason to doubt that by subtracting an arbitrary 10 per cent of the population of a city from its wage earners in manufacturing, the result will be non-ubiquitous manufactured commodities. For at least two reasons this appears illogical: (1) the varying productivity of men and machines, by places and by industries; (2) many cities, whose manufacturing is dominated by what may reasonably be classed as surplus or exportable, will either be omitted entirely or will be inadequately represented if measured by this base. Following are some of the agglomerations omitted or so reduced in appraisal as to fail to equal the number of wage earners in their dominant manufactures:

| | |
|---|---|
| Philadelphia | Columbus |
| Wilmington, Del. | Minneapolis |
| Buffalo | Birmingham |
| Jersey City | Scranton |
| Chicago | Albany |
| Birmingham | Terre Haute |

*Value Added.* On the accompanying maps, the base is value added; all cities over 10,000 population and all manufacturing districts listed in the census of manufacturing are included. The radius of each sphere is proportional to the cube root of the value added by manufacturing. The writer has prepared maps upon this base for 1930, 1920, and 1910. In them appear to be the qualities desired in a cartogram purporting to represent the phenomenon.

*The Pattern of Manufacturing Districts.* The map (Figure 1) of manufacturing activity presented here manifests much the same gross features of pattern as those by de Geer, Hartshorne, and the census. But while this is true in general, there are certain differences which merit some comment.

Ofttimes the word "belt" is used to describe the localization of manufacturing. In only a limited sense does this phenomenon in the United States merit the use of the word "belt." Unlike agriculture, this function of land use assumes the character of points or places where there will be forces operating which may be areally active. Although there is some appraisal of area, emphasis perforce is upon site and situation. That these manufacturing districts roughly correspond to the eastern half of the belt of continuous arable land, with its declining rural population and mechanized agriculture, is obviously more than circumstantial. The localization of these districts athwart the predomi-

nant routes of commerce becomes of paramount importance.

*The South.* The advantage of this weighted base over such an arbitrarily modified wage earner base, as previously noted, is apparent when certain districts are considered separately. For instance, the South employs combinations of productive factors, not common to any other comparable area in the United States. Both in the East and West, southern states exhibit manufacturing industries sufficiently different from the northeastern and Lake states as to be virtually omitted on the modified wage earner's basis. This follows from the fact that the luxury and semi-luxury goods and highly elaborated capital goods, which play so large a part in northern manufactures, are not common to either of these two southern districts. The cotton textile, wood products, and tobacco industries of the Piedmont, the chemical industries of the Appalachian Plateau and Tennessee hill lands, and the refining industries of Louisiana, Texas, and Alabama are examples. Modern methods, longer working periods, greater machine speeds, and the use of semi-automatic machines makes imperative the use of a weighted measuring unit.

*Cities with Diversified Economy.* Wherever the urban agglomerations perform the manufacturing function, the accompanying map reveals their importance in that specialty. To omit this function because of their commercial activities is tacitly to ignore the diffusion in manufactural localization. In this group will be many of the smaller cities including those approximately marking the "dry boundary" of the United States. The importance of transportation phases of machinery manufacture largely account for the inclusion of many of these latter cities.

Beyond the dry boundary are the isolated mineral-reduction and agricultural-conversion towns whose manufacturing importance certainly is overstressed on the basis of installed horsepower of prime movers.

In view of the fact that although the net factory output is increasing, the number of wage earners so employed is decreasing, the diversification of economy by cities merits especial attention.

*The Redistribution of Manufacturing.* There is a certain amount of redistribution of manufacturing industries in all countries, but in the United States where this economy is characterized by some redistribution of population, farming areas, and sources of raw materials, and where the combination of all productive factors is increasingly economic in emphasis, the redistribution of manufacturing is of especial significance. The forms which it takes and the quantitative appraisal of its movement is not of immediate concern here, but the fact that there is a shift is an imperative consideration in the selection of a base for making a map of localization of industry.

Were these changes in manufacturing simply a regional give-and-take, marked by related employment shifts, the choice of a measuring stick would be simple, but the redistribution of manufacturing occurs in many forms and shifts in wage earners will not reveal the phenomenon adequately. In the United States, industrial redistribution is predicated upon a change in the proportion of factors of production. The proportion of any one of these factors varies with its price in terms of the price of each of the other factors. Thus the proportion is determined not only by their absolute advantages by regions, but quite as often by the comparative advantage. We may say there are in general two groups of factors in industrial location: *permissive*, generally the natural factors, and

*compelling*, generally the economic factors. Again an advantage as a measuring stick is observed in value-added-by-manufacturing. Then such items as varying boundaries of industrial districts attendant upon the redistribution of manufacturing, the unusual combinations of factors of production, and the rise of new industrial centers may be appraised.

The aid of Alford Archer in statistical analysis and Leland Clover's cartographical services are gratefully acknowledged.

# SPONGE INDUSTRY OF THE CARIBBEAN AREA

*George S. Corfield*

IN 1840, a certain Frenchman named Hayman, while returning to Europe from Jamaica, was shipwrecked in the Bahamas near Nassau and was detained for some time. Attracted by the great number of sponges in use among the natives, he carried five or six hundred specimens home with him and placed them on the market. He had no difficulty in disposing of them. At once arrangements were made through the French Consul at Nassau for additional supplies. In 1849, Hayman, through his brother-in-law, a Mr. Isaacs of New York, the oldest regular sponge dealer in the United States, contracted for regular shipments of Bahaman sponges to France. No doubt he little realized that from his interest in sponges, the industry would grow, within a hundred years, to one of one and a half million dollar value. Within the span existing between the time of shipping this trial lot to Paris, in 1841, to the present, lies the entire history of the sponge industry in the Western Hemisphere (Figure 1).

With increased demand for sponges in both the automotive and paint trades, the two chief uses, a more complete knowledge of the areas both actual and potential, producing sponges seems desirable.

The area formed by the meridians 75 and 85 west longitude and the parallels 20 and 30 north latitude constitutes the region of chief concentration in the Western Hemisphere. In 1935 it supplied 74 per cent of the world's tonnage in sponges and 44 per cent of their value. Scattered locations outside this region yield very few. In the United States, Tarpon Springs, Florida, ranks as the center of chief importance. Outside the United States, Nassau in the Bahamas and Batabano in Cuba receive practically all the catch of the Caribbean, with Cuba far in the lead. In 1935 these regions together contributed 66 per cent of the weight and 43 per cent of the value of sponges of the western world.

## Varieties of Sponges

When buying sponges dealers consider size, shape, softness, firmness, durability, resiliency, absorptiveness, and color. No one sponge will satisfy all these requirements, so use usually becomes a prime factor in the dealer's selection. In the Caribbean, spongers classify their catch under the following varieties: (1) wool, (2) velvet, (3) reef, (4) hardhead, (5) yellow, and (6) grass. Each variety may be divided into several grades. Wool and velvet sponges, soft-textured, full-bodied, and highly absorbent are used as bath sponges, for cleaning automobiles, and washing walls. Reef and hardhead sponges are smaller than any other type, though of reasonably fine texture and generally with a good body. The hardhead with its harsher fiber is used principally for industrial purposes. The reef, however, with its softer fiber, is used for surgical and toilet purposes. Yellow variety, with neither the texture nor the body of the other two types, and grass sponges, probably the poorest type, are used chiefly for rough cleaning purposes.

## The Bahaman Fishery

Accounting for 22 per cent of the value and 33 per cent of the weight of all the Caribbean fishery, Bahaman

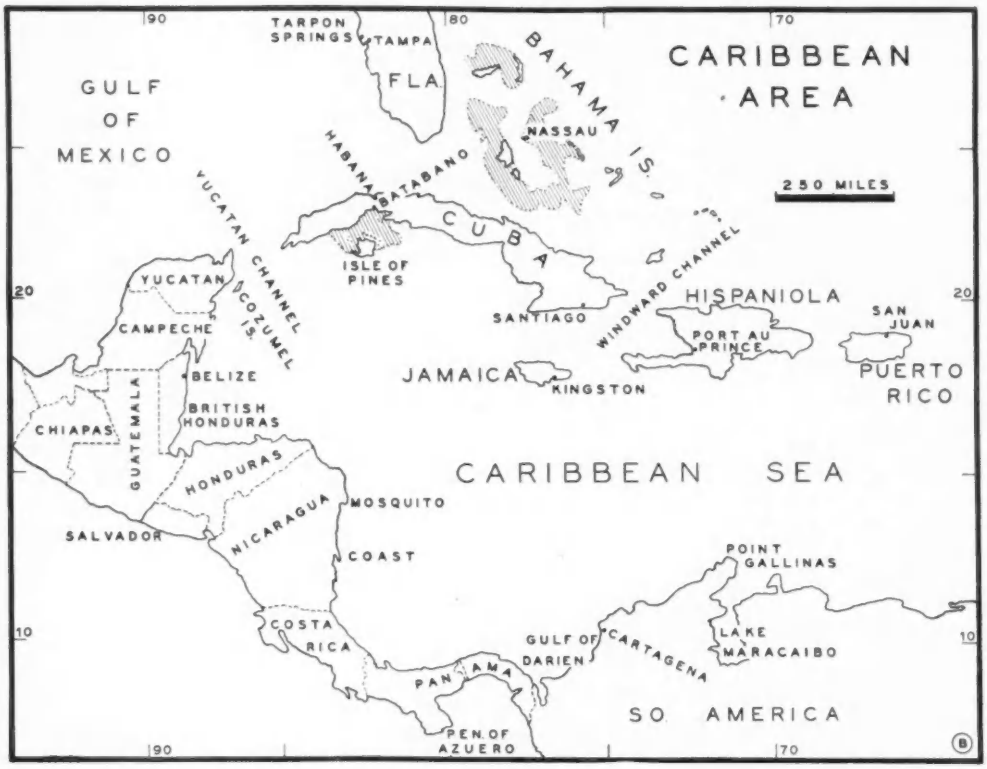


FIGURE 1.—The distribution of the sponge fishing grounds in the Caribbean area indicates that they are localized about Florida and western Cuba.

sponges are found, in general throughout the islands wherever conditions are suitable for their development. However, the most productive beds lie in three distinct areas:

(1) The region west of Andros Island, extending across the Great Bahaman Bank to the Gulf Stream. Known to spongers as "The Mud," this area varies in water depth from 3 feet near the shore of Andros to a maximum of 24 feet. Here the velvet type of sponge predominates over the wool at a ratio of three to one.

(2) Little Bahaman Bank, lying north of Great Bahama Island and west of Great Abaco Island, produces chiefly wool and velvet types, of which 95 per cent classify as wool.

(3) The territory west of Eleuthera Island, between Exuma Sound and the northeast Providence Channel, produces both the wool and velvet varieties.

To provide new sources of supply through cultivation, spongers undertake the development of areas naturally suitable for sponge growth. This procedure grants concessions to capable individuals and permits them to plant seed sponges on natural bottoms, concrete disks, or a combination of the two. This seems practical, provided suitable localities are picked and necessary attention given to seed selection. Places at present opened for planting are North Bight of Andros Island, now practically all occupied, and Middle Bight where planting is only begun. Cultivation of sponges will be beneficial to those en-

gaged in the enterprise in the following ways:

(1) It will largely obviate the necessity of outfitting crews for the usual ten- to twelve-week period of fishing on the natural beds.
(2) It will assure a certain steadiness of production.
(3) It will make for consistent quality.
(4) This will make a consequent stability of price.
(5) The areas selected will be protected by numerous cays from potential hurricane damage such as occurs in the completely exposed "Mud."

Attempts to plant in locations appearing desirable, but in which no natural sponges have been found growing, have led to the discovery that starfish and a certain type of crab prey on the young sponges and kill them. At present this is the chief difficulty of the new venture for which further research may find an adequate solution.

*Method of the Fishery.* The "hooking" method, the only one practised in the Bahamas, employs about 2,500 craft, including schooners, sloops, and open boats, of which small open boats number about 2,000. Schooners, of 10 to 25 tons, used for farther distances, carry two or more open boats, from which two men work, one as sculler, one as hooker. The sculler poles the boat to the place indicated by the hooker in the bow. The hooker locates the sponge on the bottom, unaided in clear water, but with the aid of a sponge glass in water with disturbed surfaces. The sponge glass consists of a wooden bucket with a tightly fitted glass bottom. Upon discovery of a sponge, the hooker using his hook, a sharp two- or three-tined rake-like tool fitted to the end of a long light pole, tears the sponge from its bed and brings it to the surface of the water. Water with strong currents or rough surfaces impedes progress, necessitating two or more trials before securing the sponge. Trips last from five to twelve weeks, depending upon the skill of the hooker, the weather, and the character of the sponge beds.

Spongers deposit the catch for several weeks in square or round pens called "crawls," made by driving poles close together in shallow water. Here the action of the sea water hastens the decay of the animal matter, leaving just the skeleton, the only part of commercial value. The peak of the season comes from October to July.

*Production and Employment.* Over 6,100 men, women, and children, or

FIGURE 2.—Area of the chief sponge fisheries of Cuba. Batabano, the chief center of the south shore is shown with its rail connection with Havana from which all sponges are exported.

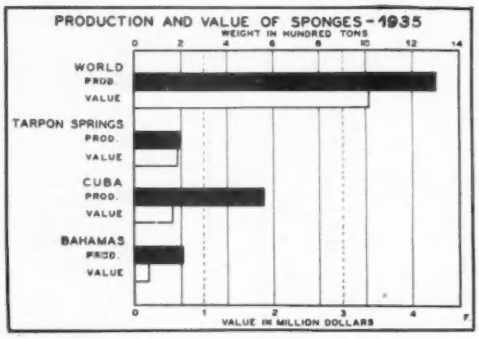


FIGURE 3.—Although Tarpon Springs is not considered within the Caribbean Region, the graph includes it for comparative purposes. Note that both Cuba and the Bahamas produced more sponges, but the "velvet," "grass," and "wire" types have less market value than the "sheepswool" at Tarpon Springs. (U. S. Department of Commerce and Statesman's Yearbook.)

about 12 per cent of the population of the islands engage in the sponge industry. The men and boys, numbering 95 per cent of the total workers, man the vessels, prepare the sponges for the auction at the Sponge Exchange. This preparation consists of cleaning and stringing them according to type and size. Sponges are sold to dealers at the Sponge Exchange by auction, and, as at Tarpon Springs, bids are made in secret. From the Exchange they are taken to the packing house where older men and women further clean, clip, size, and bale the sponges before sending them to the Sponge Merchant in New York City. The Bahamas realize nearly $200,000 a year from sponges, the most important industry of the islands.

*Future of the Industry.* A fairly stable position characterizes the sponge industry at present. The cultivation of the planted beds which give promise of a steady source of supply, and the conservation of the natural beds will do much to maintain the commodity as a principal export of the islands. The erection of a new Sponge Exchange should materially assist the industry by providing ample covered space in which the cargoes of sponges can be stored. This feature would avoid the danger of sponges rotting in the boats before they can be offered to the exporting firms.

### THE CUBAN FIELD

The north shore beds, discovered first by the more venturesome of the Bahaman spongers and yielding 20 per cent of the Cuban catch in 1908, have declined rapidly in the last three decades. A few inferior sponges, chiefly a hard quality of velvet sponge, come from the north coast of Pinar Del Rio in western Cuba. The more productive beds of the north coast lie between Cardenas and Nuevitas opposite the important beds of the Great Bahama Bank and directly south of Florida. This region yields practically all of the Cuban reef, hardhead and grass sponges. Although it lands not over 3 per cent of the total Cuban catch, Caibarien, the principal center of this fishery, is visited periodically by buyers from Batabano (1931). Several factors account for the decline of the fishery on the north shore:

(1) Limited area of shallow water near the shore. Within short distances the ocean floor drops to great depths.
(2) Disturbing ocean currents make the hooking methods a precarious undertaking.
(3) Discovery of the more favorable, continuous beds of the southern fields of shallow, less disturbed waters.
(4) Over-fishing of the beds. Laws controlling size of sponges and areas to be fished were not enforced early.

In 1936 the north shore fisheries contributed not over 11 per cent in value of the total Cuban fishery, while over the last five-year period the percentage dropped even lower.

The more important sponge beds, discovered in 1884, lie off the southern shore, between the mainland and the Isle of Pines from Cayos de Felipe to Cabeza del Este. This region, dotted with numerous small islands, keys, and rocks, has an average depth of less than 18 feet. In very few places does it reach the maximum depth of 36 feet. Outside the banks in the Caribbean Sea the bottom slopes rapidly to profound depths (Figure 2).

*Method of the Fishery.* Cuban fishing methods parallel those used in the Bahamas and at Key West. About 1,700 fishermen are directly engaged in fishing operations, but only about 300 to 500 of this number fish on the northern beds. Over 5,000 persons derive a living from the industry as a whole. The largest catch lands from March through June, while the smallest catch comes during the hurricane season from September through November.

Although the United States ranks first in value because of the greater percentage of the more expensive wool sponges gathered from deeper water by the diving method, still Cuba outstripped all other countries in 1935 in production. Sponge operations radiate from Batabano, a city of 17,700 population located on the south shore, 36 miles south of Havana. Twenty-five per cent of the male inhabitants work in the fishery (Figure 3).

The industry was further enhanced by the establishment, in 1935, of a Coöperative to handle the preparation and marketing of sponges obtained in that region. All of the "grass" and "yellow" sponges obtained in the Batabano area are to be delivered to the Coöperative, which undertakes the cleaning, trimming, packing, and marketing.

The Coöperative, composed of sponge fishermen, ship owners, and operators, establishes a minimum scale of prices,

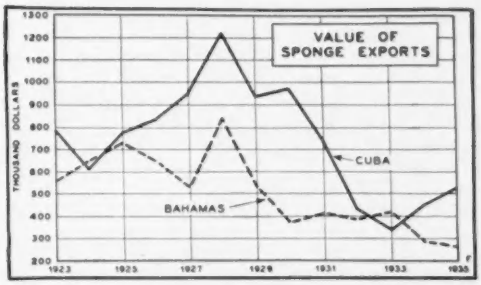


FIGURE 4.—Comparison of the two chief Caribbean sponge fields. Overfishing of the beds accounts for the Bahaman position. When their planted beds reach full capacity, the differences are likely to be less. Tropical disturbances during 1933 brought the Cuban yield below that of the Bahamas. (U. S. Department of Commerce.)

which, increased periodically, guarantees a definite return to those engaged in the industry. Standards are also established and the members of the Coöperative are required to deliver all sponges of the types specified to the Coöperative. This self-sustaining Coöperative hopes to minimize the influence of speculators and to assure those engaged in the sponge industry a fair return. Although covering only "grass" and "yellow" sponges, it has been given an option on a similar arrangement with the "wool" and "velvet" types which will be worked out within the next six months.

Sponges landed in Batabano are all shipped, either by truck or rail, to Havana at a rate varying from $.36 to $1.42 a hundred pounds according to the value of the type. All exports are made from Havana. Yearly production amounts to $455,000. The United States, the principal buyer of Cuban sponges, takes 50 per cent of the yearly production. This country, together with Germany and France, receive 75 per cent of the exports. Other European countries, Argentina, Chile, and Japan take the remaining 25 per cent. Sponge waste, trimmings from the packing houses, finds an increasingly ready market in the United States for use in

insulation, and added, in 1935, about $1,500 to the industry (Figure 4).

### OTHER AREAS

An American Syndicate, composed of business men from New Orleans, began operations a few years ago, on the east coast of Yucatan. Using diving equipment, they planned to work in depths of 100 feet or more where the better types of sponges grow. The venture did not thrive. Sponges taken on Campeche Banks and near Cozumel Island lie in very shallow water. Large "yellow" sponges are abundant, but other types are of inferior grades. Exportation from Mexico is very small.

In 1936, with services of a resident expert, the government of British Honduras began a sponge planting industry. The island of Turneffe, lying 30 miles east of Belize on the extreme edge of shallow water, along the east coast, was selected as the area best suited for sponge cultivation. The object is to grow sponges and supply cuttings for the development of concessions to be sold to individuals. The first private concession was obtained in 1929. At present three concessions are held, all of which lie near the island of Turneffe. Approximately 300,000 sponges, 60 per cent velvet and 40 per cent wool, grow on the concessions. The total investment of private capital totals $18,000.

In 1925, seven hundred and fifty pounds of sponges valued at $672 were exported from Nicaragua to the United States, while in 1905, exports valued at only $50 show the slow development of the Nicaraguan industry. Lack of government interest accounts in large part for this situation.

The Bay of Cartagena, Colombia, rich in sponge beds, yields a few sponges of excellent quality and size. Those gathered are handled in a crude way by the "bumboat" men only. As they are sold alongside vessels in the harbor, statistics concerning amounts and value are not available. Earlier, only the incompressible "hard-heads," resembling those along the coast of Venezuela, figured in the trade.

The world's supply of sponges, about 1,300 tons, comes from limited areas in the Mediterranean and Red Seas, from waters encircling the West Indies and Florida. The interest shown in Cuba, the Bahamas, and British Honduras, as evinced in the protection and advancement of the industry, and the possibility of yet undiscovered beds, indicates that the Caribbean Region will hold its place as a major producing area in the years to come.

# BOOK REVIEWS

KLIMM, LESTER E., STARKEY, OTIS P., AND HALL, NORMAN F. *Introductory Economic Geography*. 492 pp., 19 plates, 326 illustrations, statistical appendix, bibliography. Published by Harcourt, Brace and Company, New York, 1937. Price $4.00.

"*Introductory Economic Geography* is designed to furnish the text basis for a college course in economic geography that may not require any collegiate prerequisites." In the above sentence the authors state the purpose of a new and stimulating textbook in geography.

The volume is divided into five parts. Part I, pp. 1 to 34, Introductory, and Part II, pp. 35 to 106, The Physical Environment, are devoted to basic geographic factors to prepare the student for what is to follow. While the reviewer feels that a much broader treatment of physical geography is necessary for a thorough understanding of economic geography, the authors are to be congratulated in their selection and presentation of so much worth while material in approximately one hundred pages.

One hundred and fifty-four pages are given over to Foods, Raw Materials and Fuels, a section which is treated from the commodity approach. In these seventeen chapters the authors have written what the reviewer considers the best part of the book. Some readers may feel that too little emphasis has been placed upon climate, soils and topography, but a good teacher can supply this information; and the students will surely enjoy and profit by the approach in such intriguing chapters as "Sugar and Its Hundred-Year Interzonal War," "Rubber, an Industry That Migrated," and "Petroleum, a Disappearing Resource."

Parts IV and V follow with forty-five pages devoted to Commerce and Manufacturing and one hundred and fifty-seven pages given over to Regional Geography. While these two sections enlarge the comprehensive scope of the book, they are quite encyclopedic. Moreover, there is a question whether South America, our nearest neighbor, should receive only ten pages, the same number as that given to far-away Australia and New Zealand with much less area and approximately one-tenth as many people. North America, Eurasia, and Africa receive fifty-four, seventy-one, and ten pages respectively.

On the whole this bulky volume—the pages are 8½ by 11—is interestingly written, the maps and graphs, for the most part, are well constructed and reproduced, and the plates are geographic as well as strikingly attractive. In the words of the publishers it is well suited to "a course which gives major emphasis to the economic aspects of geography, and minor emphasis to regions, climate, soil, etc."

EARL B. SHAW

JONASSON, OLOF, HÖIJER, ERNST, AND BJÖRKMAN, THURE. *Agricultural Atlas of Sweden* (*Jordbruksatlas över Sverige*). 164 pp. maps, charts, graphs and text. Lantbrukssällskapets Tidskriftsaktiebolag, Stockholm, 1937.

Within the compass of a relatively small volume the authors of this thorough, comprehensive graphic summary of Sweden's agriculture have succeeded in compacting such a mass of statistical material and areal interpretation, that the whole story of the agricultural economy of Sweden is presented. The part that agriculture plays in the economic life of Sweden, the regional distribution of agricultural activities and products, the connection that agriculture has with other phases and aspects of the nation's economy, are adequately and effectively displayed.

The editor of the maps is Olof Jonasson, Professor at Göteborgs College and head of the department at the College of Commerce in Gothenburg, who also prepared the text for the maps of the physical background and of the general elements of Swedish land use and agriculture. He was ably assisted in his researches and studies by K. G. Tengstrand, candidate for the master's degree at the College. Doctor Ernst Höijer, director-in-chief of the Central Statistical Bureau prepared the text for the maps of crop distribution; and Professor Thure Björkman, Secretary of the Royal Academy of Agriculture, the maps of animal husbandry and inspection and supervision of the cattle industry. G. R. Ytterbom, agronomist for the Agricultural Society, prepared the material dealing with its activities and researches. It would have been hard to find elsewhere in Sweden so competent, experienced, and qualified a staff to do this work.

From the atlas almost any kind of information bearing upon Sweden's agricultural economy may be elicited. The significant elements of the physical background, geological, geomorphological, climatic, or pedologic are graphically presented. The area and distribution of cultivated land, of forest, of natural meadow, wasteland, the distribution of population, power, use of electricity, artificial drainage, and many other features of the land use and occupancy pattern are presented in the first 45 pages of the book. Fifty-five pages are devoted to the acreage and yield of crops of all kinds, hay and forage, fruit and root crops, cereals and fibers, legumes and fallow, sugar beets and linseed, and their relationships to region, farm characteristics, and population. The animal industries, including all domestic animals, bees, and furbearing animals occupy thirty pages of the atlas. Dairy and draft cattle and products, swine, sheep, goats, and poultry are all presented in essential fact in map and text. The volume closes with thirty pages

of maps, charts, and text that portray and explain the coöperatives, the market organizations, the supervising and research agencies, and such other economic and social groups as are concerned with agriculture.

Though modest in size and format, the Atlas is a complete compendium of the regional aspects of Swedish agriculture. The type and paper used are most satisfactory. The statistics used are down to date, the most recent available. The text is pertinent and full. The organization of the material is logical and satisfactory. The maps are simple, clear, and legible. The size of the maps has been limited by practical considerations—expense and usefulness; larger maps would have been better perhaps but harder and more expensive to produce.

The authors are to be congratulated upon the successful culmination of their work; Sweden, particularly agricultural Sweden, upon having available such a satisfactory summary of its agricultural economy. The whole world is now interested in Scandinavia's progress toward peace and prosperity, and eager to learn how Scandinavia with all its paucity and monotony of resources has been able to achieve such economic security and stability as has characterized the region during the period when the post-war depression wrecked the plans and structure of so many other European nations.

W. ELMER EKBLAW

STAMP, L. DUDLEY. *Chisholm's Handbook of Commercial Geography.* xii and 884 pages; maps and diagrams, and index. Longmans, Green and Co., New York, 1937. Price $8.00.

*Chisholm's Handbook of Commercial Geography*, a reference work for decades, has been practically rewritten from beginning to end by Dr. Stamp. He has endeavored to incorporate those parts of the old book which insured its acceptance as a standard work of reference and at the same time to stress the point of view of modern geography. The old statistical tables in the appendix have been shifted to appropriate spaces in the text, and new figures added to the tables to present the picture of post-war developments.

The large volume is divided into three major sections: (1) general facts and circumstances related to the production, distribution, and exchange of commodities, (2) commodities, and (3) regional geography. In this division of the book the author has followed the old method of organizing the subject of commercial geography.

The first part, consisting of approximately 100 pages, treats in a very general way climate, soil, irrigation, and labor as general facts relating to the production, distribution, and exchange of commodities, and transport, ocean trade routes, other means of communication, and commercial and industrial towns and countries connected with the exchange of commodities. As a rather brief treatment of each item is handled from the world point of view, each section presents the more general facts of distribution of these physical and economic factors. This part is accompanied by six world maps on climate, six climatic charts, and three maps, giving illustrations of hinterlands.

The part on commodities, occupying approximately 170 pages, treats the commodities in groups partly related to different climatic regions. The text moves rapidly from one commodity to another, emphasizing primarily the type of product, areas of production, and areas of consumption, especially for the more important items treated. The space of 170 pages is shared by more than 200 individual commodities. The more significant commercial products, such as wheat, wool, cotton, tobacco, coffee, sugar, coal, and iron, etc., get from six to ten pages each. In this section many of the commodities disposed of in from two to ten sentences each are defined in a dictionary manner and the important areas of production usually briefly stated. Throughout most of the commodity section the student of business, trade, or geography will not find a critical analysis or interpretation. This section is illustrated with five graphs on cotton, coal, and iron and one sketch map on the banks fisheries of the American North Atlantic.

The part on regional geography comprises two-thirds of the textual materials of the volume, the European portion taking up nearly half of the total space for regional geography. For one country after another the author treats such items as surface, climate, agriculture, manufacturing, and trade in a more or less uniform and compendium fashion. The section is all inclusive, the author discussing nearly all the political units and major island groups of the world, even Nepal, Baluchistan, and others of little consequence in the commercial geography of the world. The regional portion has nineteen maps mostly of a general nature and illustrating principally mineral resources and transportation facilities of the countries and continents. The book contains a wealth of factual information.

CLARENCE F. JONES

*Atlas des Colonies Françaises.* Publié sous la direction de G. Grandidier. Société d'èditions géographiques, maritimes and coloniales. 17, Rue Jacob, Paris, 1934.

The seeds planted by the Colonial Exposition in Paris in 1932 are bearing fruit—France is becoming colony conscious. French magazines give more and more space to colonial problems and even one of the popular weeklies, the "Illustration," devotes a great deal of space to colonial information while running long series of articles on various sections, i.e., Tunis, and recently one on Cameroon.

An older piece of work which seems to have escaped attention in the United States (except for a rather brief statement in the *Geographical Review*, July, 1935) and deserves more than general interest is this Atlas of French colonies, which may not rank among the best cartographic works of the last decade but of which maps are well presented and contain a wealth of information in various fields of geography. For example let us select one colony of which it is rather difficult to obtain information—Madagascar. The atlas shows the following sequence of maps on that island:

I. The general location with regular steamship lines and cables.
II. A map of location of mineral resources.
III. Three large topographic maps of the island, scale 1: 1,500,000 with nine inset maps of sections of special interest.
IV. A map of climatic divisions.
V. A detailed road map between Antananarivo and the west coast (Majunga).
VI. An ecclesiastical map.
VII. A large geological map.
VIII. A map of land utilization.
IX. A map of the ethnographic and historical base.
X. Map of administrative divisions.
XI. Map of vegetation.

Besides the maps twenty large pages (three columns each) of text cover the material presented on the maps. The result is that in this case (and also on most of the other French possessions) one may obtain the most complete information, instead of being forced to read through a tedious and not always easily obtainable reference literature. Unfortunately, no list of such literature is included in the text to make the Atlas even more valuable. From a political-geographical point of view it is interesting to note that Crozet Island, west of Kerguelen, is included under the French possessions, while France also claims a large coastal section of the Antarctic continent between Enderby Land and the Ross Sea.

The geographical value of the Atlas is so outstanding that the hope is expressed that many geography departments may decide to buy it for use in their classes.

S. VAN VALKENBURG

VAN CLEEF, EUGENE. *Trade Centers and Trade Routes.* xvi and 370 pages, illustrated. D. Appleton-Century Company, New York, 1937. Price $3.50.

*Trade Centers and Trade Routes* deals almost entirely with the field of urbanism. It analyzes the structural forms, functions and patterns of trade centers and trade routes. The term "trade center" is used in a new and very broad sense, including nearly every type of urban settlement. The term "trade route" is also used in a very broad sense. Trade routes have been interpreted so as to include all forms of communication; they embrace not only land, ocean, and air routes but also such phenomena as language, motion pictures, radio, and newspapers. The author makes no attempt to present the trade routes as carriers of the world's commercial products.

The book is about equally divided between the two divisions of the subject—trade centers and trade routes. Well constructed and reproduced maps, graphs, and charts and also pictures illustrate the volume.

The author's hope that the presentation may prove of assistance to people interested in urban and rural problems certainly should be fulfilled. National, state, and local planning are becoming of increasing importance. To men in these fields the volume should certainly prove of interest and thought provoking. The hope of the editor that the book merits a prominent place in the literature of geography, sociology, and economics and the statement of the publishers that the book is an admirable text for college courses of economic geography, commercial geography, urban sociology, trade and transportation is a bit ambitious. The author did not plan to include information on the physical and economic factors in the production, processing, distribution, and consumption of the world's commercial products. So long as the field of economic geography is primarily concerned with these things, such a volume as this will fail completely to meet the needs of such students. Its value in the other fields listed will have to be determined by students in those fields.

CLARENCE F. JONES

*Atlas des Deutschen Lebensraumes in Mittel Europa.* Edited and published by DR. NORBERT KREBS. Bibliographisches Institut. AG. Leipzig, 1937.

The first six maps have appeared for this Atlas, planned by the Prussian Academy of Science under the direction of Dr. Krebs, director of the School of Geography of Berlin University. The six are only minor parts of the complete plan but they afford an excellent insight into the type of work done. One marvels at the detail revealed in the work and also at the perfection of cartographic presentation. The cartographic work ranks among the best ever done in that field and that is high praise for a country already famous for its map work.

The first map indicates relief in contour lines and colors; a perfect blending from the olive green of the Dutch polders to the very deep brown of the high Alps. The area included extends from Calais to Warsaw and from Copenhagen to the Po Delta. The second map presents distribution of precipitation with distances of 100 mill. between the colors (200 and 500 mill. for the high amounts) and 50 mill. between isohyets.

The map of forest distribution (green on white base) is an outstanding piece of work, astonishing in its detail and in its total aspect. The same can be said for the map of distribution of population; one dot for 1,000 people with other signs for larger numbers, up to 10,000 in black, above that in red. The red makes it possible to detect at first glance urban development in its general population background. The map presents so many geographical facts and so many problems of distribution that it is difficult to tear oneself away from it. Inducive to research is the map of increase and decrease of population between 1870 and 1930. General increase of urban population but sharp contrasts on the land with heavy population losses in France, Belgium, Bohemia, Silesia against increase in the Netherlands, Po Basin, and in the Danubian Lowlands.

The sixth map delimiting the political units of the tenth century, has chiefly historical significance. Each map is accompanied by short text, which explains some features shown on the map. If the maps still to be published maintain the standard of the first six, the Atlas will constitute a cornerstone in our geographical knowledge of central Europe; at any rate, we have something to look forward to.

S. VAN VALKENBURG

MURPHY, RAYMOND E., AND MURPHY, MARION. *Pennsylvania, a Regional Geography.* x and 591 pp. Published by Pennsylvania Book Service, Harrisburg, Pa., 1937. Price $4.00.

The authors are to be congratulated for their outstanding contribution to regional geography. The logical organization and clear presentation of material are evidences of an authorship perfectly familiar with the many geographic factors which have influenced the development of Pennsylvania.

Of particular interest to those who are watching the growth of geographic thought in this country is the increased emphasis placed upon the physical setting. In the volume under consideration, the authors have based their geographic interpretations upon the fundamental physical factors in the landscape.

A glance at the Table of Contents reveals originality in organization: Part I, Introduction, 1 chapter (8 pages); Part II, Natural Setting, 6 chapters (72 pages); Part III, Landscapes of the Past, 6 chapters (82 pages); Part IV, Pennsylvania Today, 19 chapters (380 pages); Part V, The Future Pennsylvania, 1 chapter (10 pages); Appendixes—Maps and Climatic Data; and Bibliography.

The introductory chapter is short and serves merely to prepare the reader for a more detailed study of the state. Problems of location, population, land use, and industry are briefly presented.

Part II starts with a discussion of land forms, illustrated with a series of maps and striking aerial photographs. This is followed by chapters on drainage and water resources, minerals, climate, soils, and vegetation. Although no photographic illustrations appear in these sections, several well-selected maps have been introduced.

Part III deals with the landscapes of the past. In the six chapters devoted to this phase of the study, the authors trace the historical development of Pennsylvania. The survey includes discussions of the Indian landscape (1600–1700), the Colonial landscape (1740), the period of agricultural leadership (1800), the canal period (1840), and the shift to industrial leadership about 1870. The final chapter in this section deals with trends between 1870 and 1930, caused in large part by the extensive use of the state's natural resources.

Slightly less than two-thirds of the volume is devoted to "Pennsylvania Today." The state is divided into 19 regions, based upon a variety of geographical factors. Some sections are dominantly agricultural; others, industrial or recreational. It would be easy to differ with the authors on the number and the delimitations of regions in Pennsylvania, but this would be of little value in a review. The many divisions have apparently aided the authors in discussing a complex geographical pattern, and as a convenience they are justified. There are those, however, who would prefer a less-complicated regional classification. The nineteen chapters effectively treat the nineteen regions. Excellent descriptions and interpretations of the landscape have been presented. It would be difficult to obtain a superior analysis of the geography of this diversified state.

The final chapter supplies a brief picture of Pennsylvania's future. This is followed by a list of topographic maps, climatic data for selected stations, and a valuable bibliography.

A review of this book would be incomplete without mention of its excellent format. The type, paper, photographs, and maps are of superior quality.

WALLACE W. ATWOOD, JR.

SYKES, GODFREY. *The Colorado Delta.* vii and 193 pp., illustrations and bibliography. Published jointly by Carnegie Institution of Washington and American Geographical Society of New York, 1937.

In its issue of *The Colorado Delta* the American Geographical Society continues the valuable series of publications which has made so noteworthy contribution to the geographic literature of the last fifty or sixty years. Monographic in the quality and exhaustiveness of the subject matter treated, the book constitutes an outstanding example of achievement in a highly special-

ized project; few such authoritative reports as this have appeared for a decade or more. The American Geographical Society deserves all the credit due it for continuing the series throughout the stress and financial difficulty of the past depression; it must share with The Carnegie Institution of Washington, at least part of the credit, for this outstanding organization, which, like the Society itself, is engaged in the promotion of scientific research, helped in presenting the work.

Few exhaustive studies of great stream deltas have been made, despite their physiographic significance and their importance in the human economy of the region they affect; *The Colorado Delta* thus constitutes a praiseworthy attempt to extend appreciation of delta attributes, and to add substantially to the store of knowledge concerning these features of stream deposition. Deltas partake of the attributes of both land and sea, and oceanography and physiography are involved in their study.

This latest monograph on the Colorado Delta is based upon research and personal observation that have extended over forty-five years, almost half a century, and summarizes the evolution of land form and pattern of distributary over a much longer period, as well as the changing exploitation and use of the land included within the Delta itself. The book comprises four parts: I, History of Exploration and Navigation; II, Physiographic History; III, Stream Dynamics; and the conclusion.

Excellent bibliographies for each of the major phases and attributes of the Delta augment the value and usefulness of the book. Excellent maps and photographs illuminate the text. The book is printed in the same clear type, on the same superior paper, and bound in the same satisfactory manner as earlier volumes in the series. It reflects credit upon the author, the scholar who organized and prepared the material; upon the firm that did the mechanical work; and upon the American Geographical Society and Carnegie Institution that sponsored and supported the project of research and writing. It is another fine piece of work, well and creditably done.

W. ELMER EKBLAW

URBANISM COMMITTEE REPORT TO THE NATIONAL RESOURCES COMMITTEE. *Our Cities—Their Rôle in the National Economy*. 87 pp. United States Government Printing Office, Washington, 1937. Superintendent of Documents, Washington, D. C. Price 50 cents.

In this report the Urbanism Committee have assembled basic facts concerning the urban communities of the United States and have pointed out some of the underlying forces and emerging trends. They have endeavored to discover the nature of the city as it is and the forces that have made it so, in order to determine the possibilities for future efficiency if those forces are properly directed or for increasing confusion if they remain unharnessed.

The report is divided into three parts. Part III consists of the recommendations of the Committee based on their findings. Part II lists the special studies made (some of which are to be published during the coming year) and the reasons for making them. Part I makes up the bulk of the report.

Part I discusses the urban community in the national scene. It traces the development of urbanization from 1790, when the country was decidedly rural with no city numbering 50,000, to 1930 when 56.2 per cent of the population lived in a total of 3,165 urban places, five of which numbered over a million people and ninety-three over 100,000. It treats of cities as industrial centers, transportation centers, cultural centers, and governmental units. The structure of the city is presented in terms of profile and functional pattern. The individual land-use zones are described and shown in their relation to each other. Such items as transportation and communication, housing, occupations, the urban family, income, racial and ethnic differences, living conditions, rate of population reproduction and public health are dealt with in summarized form.

This part also deals with the forces that have been instrumental in bringing the city into existence and in guiding its development along certain channels—the forces that have made it a changing organism. Five preconditions of urbanization are analyzed. One prerequisite has been a "level of agricultural production sufficiently high to release a substantial part of the population from agricultural labor." Another factor has been the use of steam for power and transportation. A third has been electricity for use in rapid transit and communication; a fourth, modern technological development; and, fifth, sanitation. Of these factors, steam has had a centripetal effect, while electricity has had a centrifugal influence on the city. "Cities come into existence as products of and as focal points in the social and economic life of a people that has reached a certain stage of development."

The report also emphasizes the contemporary problems of urban America, including such topics as dislocation of industry, fragmented transportation terminals, problems of urban transit, urban planning and zoning, housing difficulties, slums, exploitation of urban land, dispersion, congestion and population problems. There also runs throughout a thread of comparison between urban and rural communities.

A liberal use of maps and cartograms markedly illuminates the content of the report. Eight folded sheets of seventeen maps show: (1) Urban population growth at five intervals from 1790 to 1930; (2) old cities (before 1850), medium-aged cities (1850–1900), and new cities (since 1900); (3) Growing urban places and decreasing urban

places from 1920 to 1930; (4) Urbanization of the Boston–New York–Philadelphia district, including built-up areas, incorporated places, and limits of metropolitan districts; (5) Estimated growth of cities due to migration from 1920 to 1930; (6) Transportation and the urban pattern in 1849 and in 1930; and (7) Metropolitan districts, distinguishing those confined to one state from those straddling state lines. In addition to these, six full-page maps show: (1) Rural farm migration 1920–30 and 1930–34; (2) Areas of industrial and population concentration; (3) Number of separate incorporated places within the various metropolitan districts; (4) Location, membership distribution, and interrelationships of state municipal leagues; and (5) Cities and counties of the United States that have planning agencies.

The maps show city sizes by circles proportional to the population. A scale is provided by which the value of the population may be obtained numerically by measuring the diameter of the circles. Twenty-five cartograms are effectively used to show percentages and comparisons.

Since the report was written neither by nor exclusively for geographers, it is hardly necessary to mention that for their use the material could be better organized. Yet, for the "facts about the rôle of the urban community in the national scene . . . the underlying forces and trends of urbanization . . . and the more significant problems arising from the extremely rapid and intensive urbanization of our country," the report gives a valuable and comprehensive summary.

ROBERT FINLEY

DOLBAR, SAMUEL H., AND OTHERS. *Industrial Minerals and Rocks.* x and 955 pages and illustrations, bibliography and index. The American Institute of Mining and Metallurgical Engineers, New York, 1937.

*Industrial Minerals and Rocks*, a monumental work, treats the mineral resources, except metalliferous ones and mineral fuels. The large volume, a result of the coöperative effort of the Committee on the Industrial Minerals Volume of the American Institute of Mining and Metallurgical Engineers and of many specialists, analyzes nearly fifty mineral products. Each chapter was prepared especially for this volume by a man recognized as an authority in his subject. Though prepared independently, the chapters follow a more or less uniform plan of treatment, emphasizing the location of the mineral deposits, the character of the formations, methods of mining, methods of preparation, and political and commercial control. The work has been carefully coördinated by the editorial board so that the volume is not a mere aggregate of disconnected papers. There is practically no duplication in the various chapters and each treatment is especially complete. The entire volume has a high degree of unity and coherence. The many maps and diagrams, well prepared and reproduced, enhance greatly the value of the book for use by geographers. The bibliography, containing hundreds of references, cites much useful material often difficult to locate and obtain. The volume is a rich mine of useful material for students of geology; industrial, mining, and technological engineers; and business men engaged in the various industries. It will prove of special interest to economic geographers because of the wealth of information not only on the occurrence and character of the mineral deposits but on the economic and other problems of mining, preparation, and distribution. The book is a valuable reference volume that should be in the library of every School of Geography, Engineering, Mining, and in the library of every student of geography interested in the significance of the possession, use, and control of mineral resources.

CLARENCE F. JONES

TREWARTHA, GLENN T. *An Introduction to Weather and Climate.* McGraw Hill Book Co., New York, 1937.

The section of weather and climate of the well known book "Elements of Climate" by Vernon C. Finch and Glenn T. Trewartha appears now as a separate textbook suitable for the teaching of such a course. The former chapters have been enlarged and thereby have gained considerably in value. The original book has been reviewed in a former number of *Economic Geography* and there is no need to emphasize again the high standard of the work and its "teachability." Without doubt this separate book on weather and climate will find its use in the many courses given on this subject in colleges and normal schools.

S. VAN VALKENBURG

LABOURET, HENRI. *Le Cameroun.* Centre D'Études de Politique Étrangère—Publication, No. 6. Paul Hartmann, Rue Cujas, Paris.

A more recent contribution to French colonial knowledge is the book by Henry Labouret on Cameroon, a study based on six months stay in that colony. It was written for the conference on international problems (Conférence des Hautes Études Internationales), which was held in Paris in the summer of 1937.

Mr. Labouret is evidently not a geographer. He has collected and studied a great deal of valuable material without the correlation needed to make it geography. However, the book gives a picture of present day Cameroon and shows well the efforts France has made to show itself worthy of the mandate. Probably the often expressed desire of Germany to have her former

colonies returned to her inspired the publication of this study.

It is hazardous—as the author points out—to make any conclusions from the contrasts in development under the pre-war German system and the present French system. Nevertheless, one gets the impression (which is strengthened by the series of articles in "Illustration") that the French have done a good job and that a possible return to Germany cannot be based on the claim that Cameroon is not well governed.

S. VAN VALKENBURG

BRANNON, MAX P. *Las Deudas Privadas en la Crisis Contemporanea.* 131 pages; synthesis for English speaking people. National Press, San Salvador, 1937.

An account of the step the Salvadorian Government took, during the culminated period of the crisis, to handle the Liquidation Problem of Private Debts. During the period of prosperity business boomed, prices soared, planters floated large loans at the banks at rates of interest, previous to 1932, at from 12 to 24 per cent per annum. The depression brought a collapse in prices; the banks began to close in on borrowers; faced with a dire situation the government decreed in March 1932 a general moratorium on all debts. Blaming both the debtor and lender for the bad situation the National Assembly in September 1935 passed the law "Liquidation of Private Debts." Amortization and interest are based on a table of variable quotas determined from a percentage on initial capital. The debtor and creditor are given equal rights. The law has saved thousands of rural families from ruin; the banks have not lost the entire principal of the loans, and interest rates have been reduced to 6 and 8 per cent.

CLARENCE F. JONES

MUSSET, RENE. *La Bretagne.* Librairie Armand Colin, Paris, 1937. Price 15 francs.

For little more than half a dollar this booklet on Brittany is available. It does not appear impressive in its miniature size, small print, and few maps, but what knowledge, what wealth of material, and what fluent style it represents. It is a first-class, scholarly piece of work based on most intimate personal knowledge and a seemingly exhaustive study of literature.

The French remain leaders in the field of geographic description in their ability to correlate nature and men. Of course, the topic lends itself perfectly to this type of work. The rocky, island-fringed coast with its little bays and gulfs, the picturesque coastal towns combining fishing and horticulture as base for existence, the vast upland with its wind-swept moors and finally to the south the smiling valley of the Loire—the garden of France—all this almost invites the hand of a master for description.

Mr. Musset has shown himself worthy of this invitation; he writes with the love of a native but also with the trained eye of a geographer. In short, here is an almost ideal regional study. One deplores that such studies are entirely missing in our country and that no effort has been made to publish for little money similar booklets on American regions. Perhaps we have not yet matured enough and the intimate contact with the geographical region is broken and not yet repaired.

S. VAN VALKENBURG

PATINO, E. ALAMS, AND OTHERS. *La Reforma Agraria en Mexico.* Departamento Autonomo de Publicidad y Propaganda. Mexico, D. F., 1937.

This publication, entitled "The Agricultural Reform in Mexico," consists of twenty colored, loose-leaf charts and maps, nine by twelve inches, and short analyses of the data presented in the illustrations—all assembled in a cardboard folder. The various charts and maps deal by state and national units with the various items of agricultural reform—the population involved, the localities, area affected by reform, the types of land in the common holdings, area harvested and value of agricultural production on lands within the reform and outside it, the areas classified according to types of exploitation, sale of the products of the *ejidales*, and other items. The materials present graphically the advantages to be gained by the agricultural reform program which is destined to have far-reaching effects for the nation as a whole.

CLARENCE F. JONES

UNITED STATES SENATE DOCUMENT NO. 199. *The Western Range; A Great but Neglected Natural Resource.* U. S. Government Printing Office, Washington, D. C., 1936.

So many of our American geographers are engaged in various phases of land use and conservation, and so many more are at least interested in the field, that this publication, prepared by the Forest Service of the Department of Agriculture in compliance with the request in Senate Resolution No. 289 of the 74th Congress, 2nd Session, introduced by Senator Norris, is of more than passing moment to them all.

It constitutes an excellent summary of the history, problems, and present condition of the 728 million acres of range area in the United States, and forms a basis and source of factual material for any study concerned with our Western Range. It represents the exhaustive and careful research of a score or more of the most competent authori-

ties on the subject in our country, not only in the Forest Service, but of many government bureaus, both within and without the Department of Agriculture, and in several state administrations.

To date this neglected domain, 40 per cent of the total land area of the Continental United States, of which more than 99 per cent is available for livestock grazing, has been sadly neglected as one of our country's most valuable resources, partly because of ignorance or lack of public knowledge, partly because of its low carrying capacity, and partly because vested interests have not wished to be disturbed in their exploitation of its advantages. A primary factor in the neglect has been the division of responsibility among public agencies, for no one federal agency has been responsible for the effective, coördinated administration of the range.

This Senate Document is of essential importance to every student of resources; of agriculture, particularly its pastoral phases; of land use and conservation. Its argument, its textual material, its bibliography are of the greatest significance.

W. ELMER EKBLAW

JERVIS, W. W. *The World in Maps; A Study in Map Evolution.* 184 pp. text, 24 pp. lists of maps and bibliography, and 24 pp. of maps. Oxford University Press, 1937.

The subject of maps never tires. Robert Louis Stevenson once said "I am told that there are people who do not care for maps, and I find it hard to believe," thus expressing the wellnigh universal interest in alien lands, foreign shores, strange seas, alluring folk. To them who delight in travel, in visits to new places, in adventures in strange lands and unusual climates, in sailing the seas and traversing the deserts, the best companion is ever the map. The good map serves as guide; it speaks a trustworthy language of its own, that needs no translator, and rarely an interpreter; it serves to beguile, to entertain, to enlighten the dull dark days when they come.

In this book the whole subject of maps is reviewed for the public in a popular way, without resort to too heavy technical discourse and explanation; from projections to lettering, from earliest attempts to modern achievements, from fantastic pictograms to topographical (in the British sense) refinements of cartography. In this book the whole history of map making is narrated in a most entertaining and educational way, and the stories of the great map makers related intimately and sympathetically.

Though the professional cartographer will find much of value and interest in the book, it will probably hold most fascination for the layman. With broadly increased opportunities and improved equipment for travel, with almost unlimited range of variety and extent of routes and itineraries available to every one, maps have become correspondingly necessary and alluring to the millions of folk who now venture fearlessly and far from their home hearths to visit the Seven Seas and the Four Corners of the Earth. As the populace travels more, the geographer and the cartographer must supply more, and ever better maps; as they are forthcoming, interest grows, and so the cycle progresses.

For American readers it is unfortunate that, because the book is British, much attention is given to British maps available for the general public, whereas all too little is said of American maps. It may be true that American maps have not achieved the same standard of excellence or the wide diversity of character and serviceability that British and Continental maps generally represent, but American map makers are making rapid strides forward, and the number of good American maps becoming available to our folk is rapidly increasing from year to year.

Altogether, the book deserves a great deal of consideration for schools, for reference libraries, and for the home study shelf. It lends itself well to all these purposes. It is clearly and fluently written. It would be a fascinating gift to any intelligent citizen. It merits wide reading.

W. ELMER EKBLAW

TAYLOR, GRIFFITH. *Environment, Race, and Migration.* xv and 483 pages, many maps and charts. University of Chicago Press, 1937. Price $4.00.

Revised throughout, and expanded by five new chapters dealing with settlement in Canada and constituting one of the first modern geographical studies of the Dominion; by two new chapters on Australia; and by more comprehensive treatment of new settlement in Siberia and Africa, *Environment and Race* as published ten years ago reveals itself under this new title. The revision and expansion of material has improved the earlier book and enhanced its value so substantially as to justify fully its new name. The book has also been appreciably improved in format and general appearance as well as in textual subject matter.

Doctor Taylor always writes in a stimulating and inspiring way. He always brings freshness and distinction to any subject he treats. He tires ever of the beaten path and loves to venture out upon, and to blaze, new trails, to tread new frontiers. He is one of those geographic forelopers whose vision extends beyond the horizon, whose ambition is to explore new fields of his science. He is the searcher for truth, *par excellence.*

It would be futile in a few paragraphs to attempt to enumerate the contents of the book, and quite impossible to convey any appreciation of its wide range of subject (every bit germane to the title of his book, however), of its challenging points of view, of its enriching store of geographic

fact. There is nothing dull or uninteresting in it, as everyone knows who read or studied the original edition, or any other of Doctor Taylor's many publications.

Doctor Taylor is both seer and prophet. His inventory of possibilities of further settlement in both Australia and Canada are of inestimable importance; if the new edition contained nothing else, it would be immensely worth while, but this forms only small part of its material, of its value.

W. ELMER EKBLAW

BOWMAN, ISAIAH. *Limits of Land Settlement; A Report on Present-day Possibilities.* 380 pp. and a wealth of excellent maps. Council on Foreign Relations, New York, 1938. Price, $3.50.

Nine other specialists worked with Doctor Bowman on this timely and valuable contribution to the material upon which further plans for extension of occupancy and utilization of the underpopulated frontier areas of the world must be based. He wrote the introduction, and Chapter X, "Possibilities of Settlement in South America," himself, and organized and directed in a general way, the preparation of the rest of the material, nine chapters.

The best way to introduce a brief review of this surpassingly serviceable book, and to indicate how authoritative, as well as inclusive, it is, is probably to enumerate each of the contributors who collaborated with Doctor Bowman and the chapter each prepared, as follows:

(1) The Prospect for Redistribution of Population, by Carl O. Sauer;

(2) The Food Supply in the Migration Process, by Carl L. Alsberg;

(3) Canada as an Area for Settlement, by W. A. Mackintosh;

(4) Population Factors in Soviet Russia, by Bruce Hopper;

(5) The Mainsprings of Asiatic Migration, by Owen Lattimore;

(6) The Present Prospect of Chinese Emigration, by Chen Han-Seng;

(7) Japanese Migration and Colonization, by Karl J. Pelzer;

(8) Possibilities of Settlement in Australia, by Griffith Taylor;

(9) Possibilities of Settlement in Africa, by J. H. Wellington.

Merely to list the names of the authors is to assure the thoroughness and scholarliness of the work; each is fully competent to prepare the chapter for which he is responsible because he is a specialist in the field which it treats.

The book was prepared for the Tenth International Studies Conference under the financial sponsorship of the American Coördinating Committee for International Studies. Each author, so the editor, Doctor Bowman, states, prepared his material "largely in his own way, with a minimum of systematizing suggestions" the better to preserve his own distinctive point of view and his own ideas of balance, proportion, and emphasis.

The book reflects not only the high professional caliber of the authors, but their interest in the subject. Every chapter is eminently satisfying, for despite the compact treatment required for every chapter to bring the material within the compass of one book, the salient facts and principles underlying the treatment are fully presented in each, with a well-selected and adequate bibliography at the end of the book to suggest sources for full, detailed information on the several phases of each subject and region discussed.

Naturally among ten authors, all specialists with diverse backgrounds of training and contacts, complete uniformity in manner of treatment would be unreasonable to expect, but uniformity of high quality of treatment has been achieved to a surprising degree, due undoubtedly to the eminent attainments of the authors in their several fields, and reflecting the care and discrimination with which they were selected for the task. That so uniformly high standard of scholarly and yet practical, achievement is maintained throughout the book, insures a permanent value for it in geographic literature and the literature of settlement and population, and an enduring respect for it in every country where civilization seeks new solutions for the problem of overpopulation.

The book is simply yet attractively bound. The paper and type are excellent. The mechanical make-up is in every way satisfactory. The authors all write lucidly, fluently, convincingly. In every way the book is surpassingly good; and since in addition it renders an incalculable service, it more than justifies its issue and a wholly favorable review.

W. ELMER EKBLAW

DELEGATIONS FOR THE PROMOTION OF ECONOMIC COÖPERATION BETWEEN THE NORTHERN COUNTRIES. *The Northern Countries in World Economy.* Published in Finland, Otava Printing Office, 1937.

The Northern Countries—Denmark, Finland, Iceland, Norway, and Sweden—have stood together since 1934 in an effort to achieve a close-knit coöperative organization for peace and security and common promotion of common interests in the economic field among themselves, and in their international relationships. The community of purposes and interests thus established or promoted are expressed in this book, which is an exposition of the economic factors and problems in their common world relationships and intercourse.

As the whole world knows, the Northern Countries have pointed the way in economic, social, and political coöperation; in the last half century they have achieved an enviable preëminence in the fine arts, in pure and applied science, in social and financial reform, in the search for peace, and in the community integrity. They lead the world toward its next advance in civilization.

The volume not only deals with the common economic problems of the Countries of the North and with their coöperation in solving the problems, but constitutes in itself a manifestation of the spirit of peace and coöperation among them. It was published on the initiative and the authority of the Delegations which were chosen by the respective governments in 1934 for the promotion of further economic coöperation. The delegations represented men from many branches of national economy in their respective lands, who conferred from time to time at the several capitals in the years following, and outlined a broad, constructive plan for further coördinated effort. As they discussed their common problems they were impeded in their decisions by lack of a general survey of the position of their group of lands in world economy; and to supply the lack, the material for this book was compiled, organized, and compacted into suitable size for publication. It has thus been presented to the peoples of the world.

Thus definitely and authoritatively prepared and put forth, it constitutes an indispensable addition to every library of the North. It represents the latest, most complete, and most carefully evaluated survey of the part the Northern Countries play in world economy as consumers and producers, as distributors and carriers, as importers and exporters. It includes all the basic industries—agriculture; fishing and whaling; forestry and woodworking industries; mining, metal, and quarrying industries; shipping; other manufacturing; and communications and tourism. It discusses the basic elements in the economic structure of the Northern Countries, the international balance of trade and finance, their commercial policy, and their economic coöperation. Many valuable tables are appended.

Every American geographer, economist, and business man needs this book in his working library. It is a highly creditable piece of work from every point of view.

W. ELMER EKBLAW

VAN CLEEF, EUGENE. *This Business World; An Economic and Commercial Geography.* vii and 407 pages, richly illustrated with maps, charts, and photographs. Allyn and Bacon, New York, 1937.

A workable, teachable textbook this is, that begins with a study of commodities, considering their production with special reference to the United States, follows with a survey of foreign lands by political units, and concludes with a discussion of the environment of the various peoples, their economic and commercial relation to it, and finally an estimate of their future.

The book is intended to expand the social intelligence of American youth, as a first requisite to social security, and it is designed with this end in view to guide the teacher and to encourage the pupil to broaden his own experience and to orient himself in world affairs.

The text is fluent and forceful; the maps clear and illustrative; the subject matter interesting throughout. It is a stimulating textbook.

W. ELMER EKBLAW